

CIO

WebBusiness

SECTION

SEPTEMBER 1, 1999

142 PAGES IN
TWO SECTIONS

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desktop—or wherever your
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Classes That Click

PAGE 30

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FROM _____

TO _____

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WebBusiness

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SECTION 2

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Internet2...and Counting

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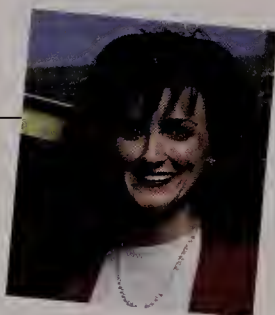
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Decoding Death

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By Art Jahnke

ON THE COVER

Web-based training
programs can
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Anna Young,
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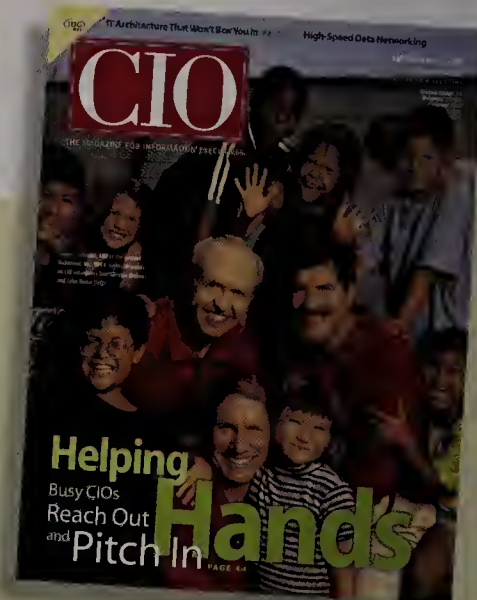
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BUSINESS STRATEGIES Deregulation is forcing utilities to define themselves in new ways and sell themselves to new customers. And the shock of this newness is falling on the power company CIOs.

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WORKING SMART Handheld computers have helped doctors at this hospital make better decisions, saving both lives and money.

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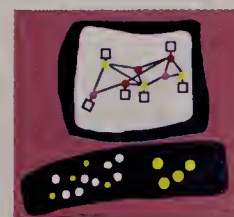
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Brick by Brick

WE'VE HAD SOME VIGOROUS INTERNAL DEBATE HERE ABOUT whether the term *brick and mortar* has become an overused descriptor and should thus be expunged from our pages. Arguments in its favor have so far prevailed (mostly because we can't think of anything else that conveys the same easily understood meaning).

But who knows its ultimate fate? To many businesses—and especially to retailers with considerable investments in hard infrastructure—deep-seated fear centers on the possibility that someday, perhaps sooner than later, the need for such a distinction will disappear, along with their real-world customer-facing venues.

Will Macy's next big sale consist of millions of square feet of undertrafficked retail real estate? Can most of what a business does with and for its customers be sustained over the Web?

Apparently, proprietors of brick-and-mortar businesses are wondering hard about this question. And some are trying to incent congenial crossover from the online to the physical realms. For one, the Ethan Allen furniture chain, spurred on by the inroads of such online-only outfits as Furniture.com, has announced plans to take orders over the Web for items that will then be delivered and serviced by local dealerships (EA will reportedly give 10 percent of every online transaction to the local dealership). Likewise, the Circuit City electronics giant is doing much the same thing, giving its online customers the option of picking up locally any merchandise they order over CC's Web site. The selling point is that customers save on shipping costs and can experience the joys of instant gratification.

For their part, smart retailers believe that they sell more stuff to people who walk down their actual aisles than to those who merely hyperlink. When eyeballs roam freely over brick-and-mortar display space, impulse buying is at its best. And until the still-primitive ability of Web sites to convert historical customer data into one-to-one marketing insight hits its stride, the skeptics are probably right to think that the Web limits some kinds of opportunity.

Of course, it also creates opportunity. While retailers have striven to transport some of the pleasures of brick-and-mortar shopping to the Web, others want to go in the opposite direction. A different kind of crossover is evident in a set of initiatives announced by @pos.com. Formerly known as Mobinetix Systems Inc., a vendor of pen-based POS signature capture technologies, @pos.com describes its expertise as "Web-enabling the point of sale." What this means in practice, apparently, is deploying POS terminals that integrate the in-store shopping experience with the virtues of the Web: paperless transactions, credit-card settlement, access to the customer's purchasing history for interactive triggers to additional personalized offers.

Anyhow, these tensions are playing out both creatively and painfully as the physical world tries its best to mesh with pixels and packets. As you integrate the Web with the brick-and-mortar infrastructure, is the going tough or easy?



Lew McCreary
Lew McCreary
Editorial Director
mccreary@cio.com

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Founder Joseph L. Levy

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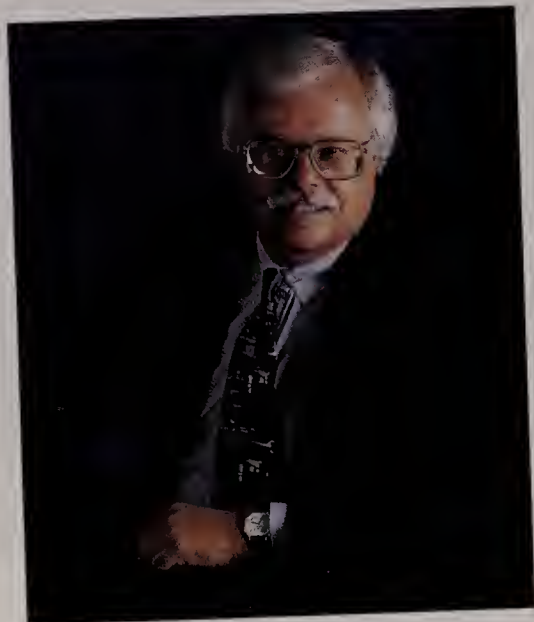
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The New Economy

I AM SURE I DON'T HAVE TO REMIND YOU THAT WE HAVE ENTERED a new stage of the world economic order. Although some people may refer to it as the Internet economy, I prefer to call it the knowledge economy.

The old economy was static, with change occurring relatively slowly, whereas the knowledge economy is increasingly innovative and entrepreneurial. CIOs wishing to succeed in this exciting time must embrace change and adapt quickly to it. They will also play a bigger, more important role as leaders of the knowledge economy. Compaq Computer Corp.'s promotion of former CIO Michael Capellas to president and CEO is a recent example of the growing importance of and respect for the CIO position.



CIOs and information technology are the twin engines in boosting the productivity of the world's economy. The continued growth of the knowledge economy will come from the IT and emerging knowledge sectors. The economists, however, might not agree with me because their measures of productivity growth are "old economy" oriented—they measure tangible things like widgets off an assembly line, not intangible products of the new economy.

But we're doing something right. The U.S. economy has sustained the longest peace-time expansion without a recession in the nation's history. Our economy has been growing approximately 4 percent annually for more than three years. Every quarter, 250,000 new jobs are created. The stock market is booming. Unemployment is at an all-time low. Inflation is under control.

The financial world has benefited from the advances in computers and communications. Today's global information infrastructure not only allows for better information but permits executives to react instantaneously to opportunities that emerge anywhere in the world. Trillions of dollars can be moved around the world in seconds to take advantage of the most promising opportunities.

In my opinion, CIOs and IT have enabled the shift from hierarchical, bureaucratic organizations to networked organizations where information and decision making move horizontally within flat organizations. The IT infrastructure that you and your colleagues have created is responsible for the prosperity we are now enjoying. I think the best of times are still to come. What's your opinion?

Joseph L. Levy

Joseph L. Levy
President and CEO, IDG Communications Inc.
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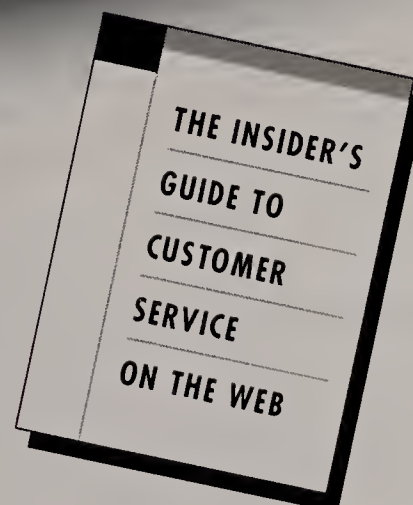
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THREADS

Networking Gets Human

NOW THAT THE INTERNET HAS been connecting lonely adolescents with each other for years, it's finally being put to good business use, connecting Web vendors with Web builders. By coincidence, two unrelated companies, one in Boston and one in San Francisco, have launched similar sites, each hoping to act as brokers for local Internet business.

The more ambitious of the two, Boston-based NewMediary Inc. (www.newmediary.com), offers users more than a place to meet. NewMediary publishes news and commentary about the Internet business in the Boston area. (In the interest of full disclosure, we should mention that *CIO* columnist Scott Kirsner is a regular contributor.)

"Our goal is to connect buyers and sellers of Internet services," says Founder and President Scott Cohen. "But we know the dirty little secret of Internet business directories: They're boring; they don't drive traffic. So we added the editorial to give people a reason to check in two or three times a week."

NewMediary.com allows users to post requests for services and allows service providers to bid on projects. If the deal is done, NewMediary gets a piece of the action. That money and advertising revenue, says Cohen, will pay the rent.

IT'S THE THOUGHT THAT COUNTS

"The bottom line is we in America have all the computers in the universe and we still rank 18th in math and physics worldwide."

— Michael Dertouzos, director of the Laboratory for Computer Science at MIT, talking to *The New York Times*



(SWD) Single Web developer enjoys profit, seeks (JP) Java programmer who likes to work long hours.



On the other coast, eWork Exchange Inc. (www.ework.com) does much of the same, matching freelance "e-workers"—programmers, graphic designers, Web developers, content writers and the like—with Internet-based projects. The eWork Web site also functions as a virtual marketplace where project managers post their projects and contractors post their availability and work interests. Posting information is free; eWork will derive revenues from advertising, matching fees from customers willing to pay for an advanced look at opportunities, facilitating legal arrangements and renting software applications downloaded to create collaborative workspaces.

According to CEO Hans Bukow, eWork borrows a page from just-in-time manufacturing by matching projects and people on an as-needed basis. Bukow says eWork will enable digital information projects to be managed in what he calls producer-style management: "Through finding the best people for specific tasks and managing them in virtual workspaces."

Bukow thinks he got a winner. So does NewMediary's Cohen. In any case, things are about to get more interesting for both of them. NewMediary plans to open an office in San Francisco and New York later this month.

—Megan Santosus

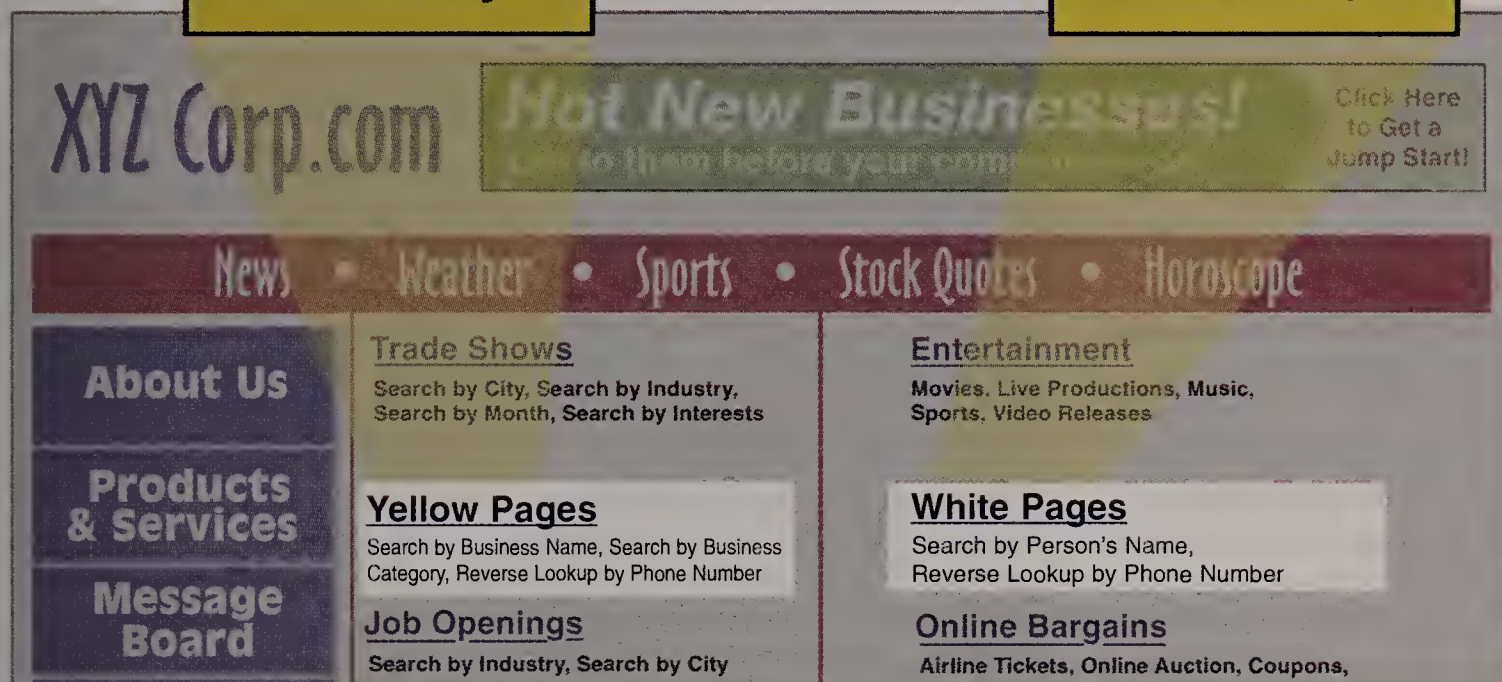
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Sci Society Until recently, the Society of Toxicology hasn't had much in common with the Organization for Tropical Studies, the Poultry Science Association or the American Ornithologists' Union. But that's changing, as those groups and 50 other small scientific societies join forces to launch a Web-based research database.

BioOne, scheduled to make its debut early in 2001, will house full-text electronic versions of all members' journals and bulletins. (Sample titles: the ornithologist quarterly *The Auk*; the American Society of Plant Physiologists' monthly *The Plant Cell*.) Ultimately, BioOne could include nearly 200 biological, environmental and ecological publications.

Currently, many small, highly specialized societies can't afford the technology and staffing necessary for full-scale Web publishing, says Richard K. Johnson, director of the Scholarly Publishing and

Academic Resources Coalition, a Washington, D.C.-based library group. Instead, some post only the most recent print version online. Others provide only abstracts or tables of contents. Many allow access only to subscribers or members.

Meanwhile, many societies see their journals' hard-copy circulation steadily declining. That's because their major customers, budget-conscious research libraries, must pick and choose between hundreds of journals with subscription costs averaging \$150 a year. Eventually, societies may sell their journals to high-price commercial publishers, who create slicker, more competitive versions—and charge even more for them.

BioOne, a first-time collaboration, allows societies to keep their journals, put current and archived issues online, and offer the issues to libraries in a single, more affordable package. That in turn creates a valuable one-stop source

Still Growing

Predicted worldwide Internet use in 1999 **130.6 million**

Predicted worldwide Internet use in 2003 **350 million**

SOURCE: EMARKETER

for researchers, who can navigate quickly between related journal citations rather than jumping from site to site, finding varying amounts of information. "By acting collectively, they can all be in one spot that attracts the user," Johnson says of the small, highly specialized societies. "By going it alone, they risk being left out, lost in the shuffle."

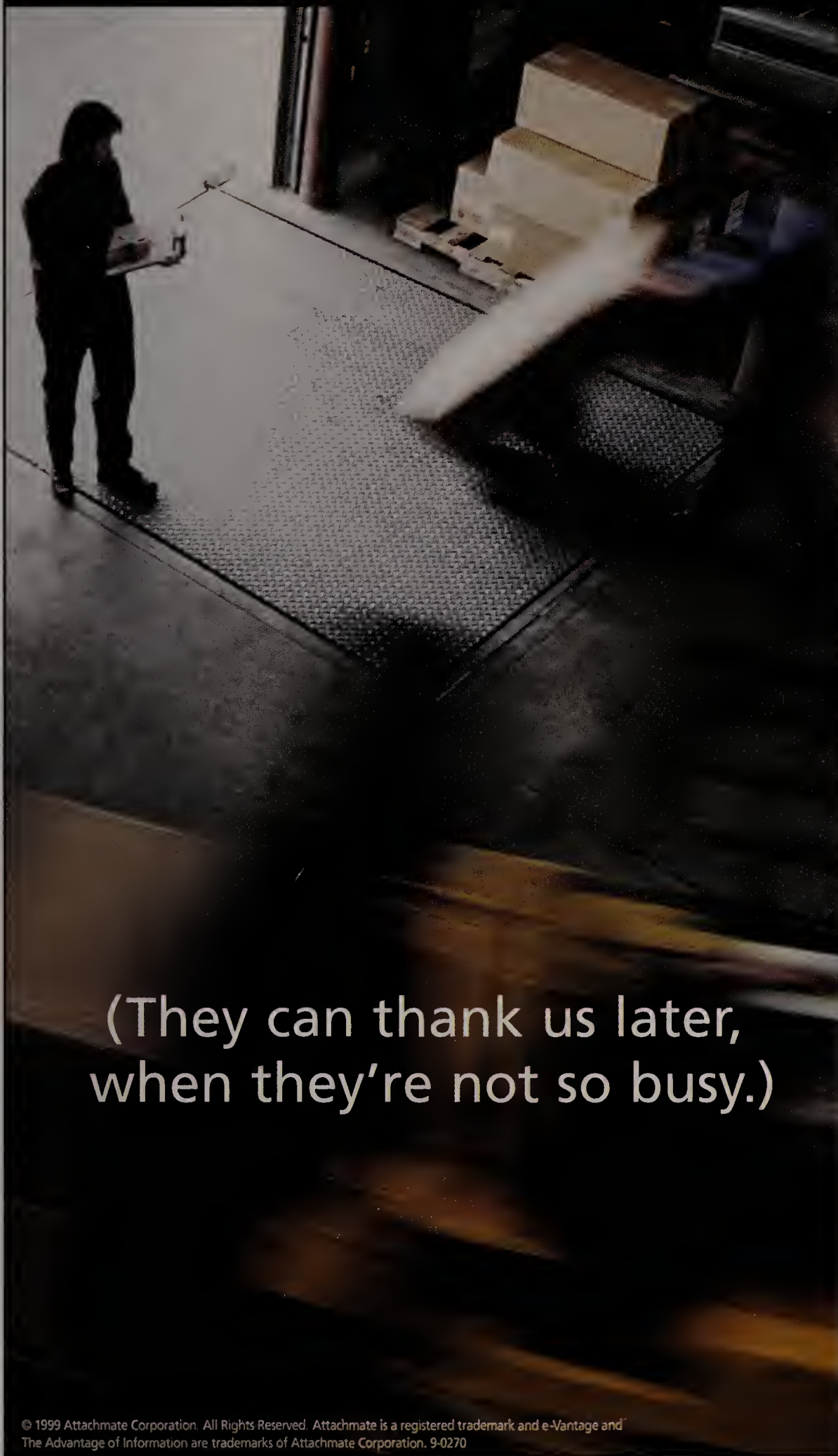
Several library organizations will cover BioOne's estimated \$750,000 startup costs. Libraries will also pay fees for database access. Eventually, BioOne proponents say, they could use BioOne to create electronic peer-review of scholarly articles, getting research online quickly. But that proposal is likely to generate concerns about security or accuracy, as it has with other medical and scientific database ventures. —Anne Stuart



Geek Is Good

TO HELP MAKE SURE THERE ARE ENOUGH high-tech workers for tomorrow, the Department of Commerce plans to run a public service campaign next year targeting teens with this message: Technology is cool. The campaign comes out of the DoC's two-year technology workforce development effort, which has been scouring the country looking for solutions to the IS staffing crisis. According to a commerce department spokeswoman, a constant theme heard coast to coast is that teens who show an interest in math or science often get teased by their peers, discouraging them from pursuing high-tech learning, let alone a high-tech career. At one southern high school, for example, science- and tech-oriented kids reported being ostracized and called nicknames like "Steve Urkell." The TV ad and poster campaign, to be developed with the help of Women in Film, a Hollywood-based nonprofit entertainment group, will showcase the fun side of technology—that is, techies who do things like create the special effects behind *Star Wars* or do the computer modeling behind the *Titanic*. Now that's cool. —Sari Kalin

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A Guide to Fine Diners

For years, diners have enjoyed the benefit of restaurant guides to help decide which restaurants serve the best food. Now a Boston-based entrepreneur is trying to give restaurants a guide to diners, one that will separate the big spenders from the cheap-skates. Foodline LLC (www.foodline.com), an online restaurant guide, recently added a section that lets users make restaurant reservations online.

The new service, which has so far signed only two restaurants in Boston, promises several advantages to diners: they can book tables without calling around; they can book tables any-time, day or night; and they can search for restaurants whose style and price meet their hearts' desires. But what is

revolutionary, says Paul Lightfoot, president and CEO of Foodline, is the information about diners that Foodline will give to restaurants. Foodline asks customers to fill out an online profile from which it garners eating and spending habits—weeding out the customer who splits an entree with her spouse from the one who will splurge on the lobster without a price tag. Then the site uses data mining to categorize spending habits.

"When fully booked," says Lightfoot, "restaurants can optimize revenue per fixed number of tables by restricting availability to restaurant-goers identified as high spenders."

For tightwads, the wait just got longer.

—Kathleen Carr



Stiff Upper Lips (and Fingertips)

If you thought customer service was lousy on U.S.-based Web sites, don't try to get an e-mail response from Web sites in the United Kingdom. A recent comparison conducted by Jupiter Communications LLC and Hewson Consulting/eGain Communications Corp. revealed the following:

Response Time for E-Mails to E-Commerce Web Sites

	U.K.	U.S.
One day	25%	31%
More than two days	29%	34%
No response	34%	25%
No e-mail address	12%	10%

SOURCE: ACTIVMEDIA RESEARCH LLC



Retail Details

86.8 percent of online retailers say that their online prices are the same as their offline prices.

40 percent of online retailers do not keep user or customer records.

52.2 percent say they are making money.

20.8 percent have no offline outlet.

SOURCE: ACTIVMEDIA RESEARCH LLC

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Pun The information superhighway meets the interstate at the Internet License Plate Gallery.

The online gallery (www.webreference.com/outlook/license) showcases

about 30 Internet-related vanity license plates from a dozen states. The gallery is part of Internet.com Corp.'s WebReference.com, an Ann Arbor, Mich.-based resource site for Web developers.

—Anne Stuart

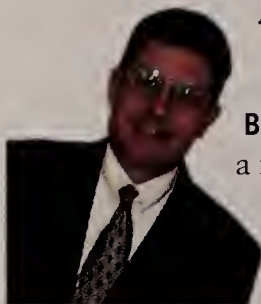
BITMAP (Rhode Island)
BIZWEB (Kentucky)
EMAILME (Michigan)
E-VA.COM (Virginia)
HTTP (Michigan)

INTERNET (Pennsylvania)
INTRNET (Michigan and Alabama)
NET DUDE (California)
NETMOM (New York)

SUPR USR (Illinois)
WBMASTR (Maine)
WEBDZNR (Idaho)
WEB GURU (California)
WEB HEAD (Florida)

Crime Watch

AS THE LEADER OF PRICEWATERHOUSECOOPER'S information protection practice, William C. Boni has seen plenty of computer mischief, including the sneaky virus know as Back Orifice and scavengers who search trash cans for system information. Boni is also the coauthor, with Gerald L. Kovacich, of *I-Way Robbery: Crime on the Internet* (Butterworth-Heinemann, 1999). We asked Boni a few questions about who's getting away with what.



Are there any real trends in crime on the Internet?

Boni: There is no centralized reporting on a national or even global basis, so it's difficult to say that the reported incidents constitute a trend. That notwithstanding, however, we are seeing something.

In the past, most computer crime was committed by insiders. With the Internet, extranets and global networks, the threat posed by outsiders is catching up. Some large Internet providers have had security breaches that are often directed at them from the other side of the world. And recent studies conclude that e-commerce and Internet activity significantly increase the threat to a company's proprietary information and intellectual assets.

What can e-commerce companies do to protect themselves?

Boni: Businesses should have processes, procedures and technologies in place. Typically in e-commerce, there's been a strong emphasis on having outstanding technical security such as encryption, but the procedural and operational aspects of security aren't thought out. For example, they



may allow an order—using a real name and credit card number—to be shipped to another address. In hindsight, the shortcoming seems so obvious, but without an integrated approach of technology combined with process and procedure, such things happen.

Do e-commerce companies need a dedicated security executive?

Boni: Absolutely, and it should be an executive-level security person. If e-commerce companies do have a dedicated person, it's typically a security specialist who is too far down the food chain and is concerned primarily with system operational issues. At the higher lever, there needs to be someone who can articulate the risks to management, who knows how to respond to particular incidents and who can spell out the options and consequences to allow senior management to make an informed decision. What's at risk is often not the direct financial loss. If what's at risk is a brand or reputation of a global firm as it pilots an e-commerce initiative, there needs to be high-level security leadership.

—Megan Santosus

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Knight Moves

The Internet Chess Club's pay-to-play formula wins on the Web, despite challenges from no-cost competitors

BY DEREK SLATER

DON'T TELL DANIEL SLEATOR THE MEMBERSHIP model doesn't work for online gaming sites. Sleator's site admittedly isn't the usual venue for preteens wielding swords, spells or space blasters in the latest multiplayer shoot-'em-up extravaganzas. But perhaps that's precisely the reason for his success. Instead,

Sleator's patrons play a game that's, oh, about 2,000 years old. And they spend \$49 a year for a relatively low-tech experience in Sleator's Internet Chess Club (ICC), despite the availability of free chess services elsewhere online.

What's most unusual about the ICC (www.chessclub.com) is that it's growing—with 20,000 paying members at last count—and it's profitable. Other online game sites have tried unsuccessfully for years to support themselves with membership fees. In fact, the model has worked for only a handful of businesses, says Seema Williams, an analyst in the consumer e-commerce group at Forrester Research Inc. in Cambridge, Mass. One such business is Ultima Online (www.ultimaonline.com), the multiplayer fantasy world run by San Mateo, Calif.-based Origin Systems Inc. Most other gaming spots rely on ad banners for income. But ICC's formula—offering unlimited online play in exchange for an annual membership fee—seems to be working just fine.

The club's chess servers enable players to find opponents anytime and to play games at any speed, from slow games that last several hours to "lightning" contests in which each side has one minute for the entire game. The ICC software tracks players' results and ratings (a number that roughly indicates a player's chess ability), enforces rules and even allows for a number of variations on the traditional regulations, such as rearranging the pieces' starting positions.

The club started life—no one is quite sure exactly when—as one of several free Internet chess servers, with players logging on via telnet sessions. Sleator, a professor of computer science at Carnegie Mellon University in Pittsburgh, started fiddling with the code on a CMU-hosted chess server in 1992, adding features and enhancements that at least doubled the size of the original code base. In 1995 he and cofounder Eric Peterson, a retired geophysicist, started kicking around the idea of converting the server to a membership-based club, a suggestion that met with players' predictable wailing and gnashing of teeth. "At the time, there were



Keeping things in check: Daniel Sleator's chess club offers online play for a membership fee.

a few [online] subscription services, like *The Wall Street Journal*, but [the concept] was still pretty outrageous," says Sleator, now ICC president. The pair persevered, working for a year without pay to set up the service, moving the code to a new host at an Internet service provider and adding more features. For example, the ICC now maintains a small database for each player, tracking his or her recent and all-time-favorite games. The servers also hold automated tournaments daily, and players can improve their skills by walking through lessons run by "lecture-bots."

The ICC's other remarkable achievement is its success despite competition from other sites providing many of the same features free of charge. Yahoo Inc., Lycos Inc. and other well-known portal sites offer free chess games to their millions of visitors. And the Burnsville, Minn.-based Free Internet Chess Server (www.freechess.org) is based on the same core code from which the ICC was built; it even advertises pointedly that "We do it for the game—not the money."

So why do ICC members pay to play? For starters, the free services have less-controlled atmospheres. Profanity and innuendo seem much more common on free sites than on the ICC, where members risk getting booted for such behavior. But it's player quality that seals the ICC's allure. The general-purpose sites clearly appeal more to casual players; tournament-caliber opponents are hard to come by. In contrast the ICC's clientele includes numerous internationally titled players, all the way up to grandmasters—the black belts of chess.

Grandmasters not only compete on the ICC but also use the club as an advertising venue for chess lessons, lectures and other activities. Sleator calls those opportunities distinctly beneficial to many professional players who might otherwise find it hard to get by on chess alone (especially in the United States). Michael Rohde, a grandmaster who

earns his living as a tax lawyer in New York, paints a somewhat less rosy picture of the ICC's value to pros. "You reach a lot more people, but so does the competition—and so the price of what you offer goes way down." However, Rohde plays a number of games on the ICC each month just for fun. "The ICC has become part of the mainstream for U.S. chess, so it has won that war," he

Most other gaming spots rely on ad banners for income. But the ICC's formula—offering unlimited online play in exchange for an annual membership fee—seems to be working just fine.

says. The possibility of playing against grandmasters like Rohde, as well as lesser-titled players, provides a powerful draw for other ICC members. The site's home page, which alerts arriving visitors to the number of games in progress, also lists the chess stars online at the time.

The club has even experimented with creating a little in-house economy with a basic unit of currency, the chekel. Buying chekels is easy; the ICC already has most players' credit card information from their membership fees. Players can redeem chekels for services such as online lessons from grandmasters.

To continue building its player base, the ICC also maintains a cozy relationship with the United States Chess Federation (USCF) in New Windsor, N.Y., the country's organizing body for the game.

The ICC advertises in the USCF's print publication, *Chess Life*, and has linked banner ads on the U.S. Chess Online Web site (www.uschess.org). The ICC pays a small bounty for each new member who comes from the U.S. Chess Online site; the federation similarly pays the ICC for each ICC member who joins the national federation.

Sleator and ICC employees also attend the biggest real-world U.S. chess tournaments, where they set up promo-

tional booths and broadcast the moves of the top games in real-time over the ICC. The Internet's worldwide reach is key because chess has a much higher profile and much greater popularity in other nations, particularly Russia and Europe. In fact, the ICC, which draws its membership from more than 70 nations, has created Spanish and Swedish versions of its home page to further increase its international appeal.

But despite the ICC's success, chess games probably won't attract multimillion investments from venture capitalists. Even with close to 20,000 paying players, the ICC is smaller than one-tenth the size of Kali Inc. (www.kali.net), which hosts multiple online

games of the swords-and-blasters type and claims to be the Web's largest gaming site. Still, how many other such sites can boast of turning a profit? (For more on gaming industry business models, see "Ahead of the Game," CIO Section 2, May 1, 1998.) The ICC benefits from a good deal of free labor: Its system administrators, who moderate disputes and provide informal technical assistance to the membership, are unpaid volunteers. "I think what they get out of it is they are important members of a very big community," Sleator says.

As for those no-cost competitors, Sleator seems relatively unworried. "We keep an eye on Yahoo; we can learn from them," Sleator says of the Web's dominant search engine and portal site. "Those other chess servers, if we use them properly, can be a big bonus for us" both in terms of increasing general interest in chess and in helping the ICC learn to make it easy to play online. Meanwhile, the ICC's staffers are continually working on their site's interface. Their goal, Sleator says, is to match the free clubs' ease of use while offering a more robust service. "We want the complete newbie to be able to jump in and click one button and be able to play." **CIO**

Senior Writer Derek Slater can be reached at dslater@cio.com.

www.chessclub.com

THE MAIN ATTRACTION

The Dirty Dozen

*Does your Web site tick off users?
If you're guilty of these pet peeves,
you could be doing just that.*

BY SCOTT KIRSNER

WARNING: THIS IS A VERY CRANKY COLUMN. READ it while you're recuperating from a nasty Labor Day sunburn or just after you've received an outrageously expensive speeding ticket. It had its genesis at a very bad Internet conference, after a very bad lunch of slippery chicken and limp asparagus. A group of presenters were sitting around the table, drinking coffee and dreading their inevitable return to the conference room. Since everyone seemed to be in a bad mood, I tossed out a conversation topic designed to engage the misanthrope in everyone: What is your biggest Web pet peeve? What is it about a Web site that drives you away and turns you into a noncustomer for life?

Everyone at the table—site managers for companies big and small, Web developers and consultants—perked up and began tossing out their least-favorite features and bugs. We went on for so long that we had to be dragged back into the conference room. In the weeks that followed, I began collecting pet peeves from other experts in the industry.

"If your site contains too many of these pet peeves, the end result is a bad taste in the user's mouth," says Stephan M. Spencer, founder and president of Internet Concepts LLC, a Web design boutique in Madison, Wis., and one of the participants in that lunchtime gripefest. "Users won't come back, and even worse, they'll probably tell some friends how bad your site is. It has an exponential effect."

So below I present The Main Attraction's Dirty Dozen. Some are my own, some are from my survey of well-regarded kvetchers. Ignore them at your peril.

1. Stale content. "To me, there's nothing more off-putting than a Web site with overtly outdated material," says Sam Birger, president of Nomenon, a Cambridge, Mass., naming agency. "You find notices of product releases 'to come,' which have actually been out for years, or boasts of businesses celebrating their upcoming fifth anniversaries in 1997." There are few better ways to show users that you don't care about the Web as a communication vehicle than by operating that kind of "cobweb" site, where no one is responsible for keeping the content fresh.

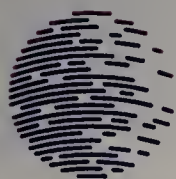
2. Fouled-up forms. "My pet peeve is when you fill out an unbelievably long form, only to get a message that says, 'Never mind,' and it wipes out all your information," says Kathy Biro, chief executive of Strategic Interactive Group,



ILLUSTRATION BY NAOMI SHEA



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a Web developer in Boston that works with clients like Dell Computer Corp., Kraft Foods Inc. and Federal Express Corp.

"On E-Trade, you can spend the better part of an afternoon filling out a form, only to get the missive, 'Server is busy, try again later,' and everything you've input is gone." Forms-processing engines should save all information that users key in, and they should be intelligent enough to correct minor errors, such as when users deploy dashes instead of spaces in a credit card number or use "9" instead of "09" to represent September in a date field.

3. Inconsistent navigation. Marc Poirier, a general partner with CMGI affiliate @Ventures, an Andover, Mass., venture capital firm, is miffed by sites that don't have a consistently presented set of navigation tools. "You drill down to inner pages, and you get to a point where you can't get back to a main page because there are no longer any links to the major site areas; the only way back is to hit your browser's Back button five or six times. Who has time for that?" he asks.

And while we're on the topic of navigation, Spencer of Internet Concepts says he gets frustrated when he encounters sites that sport navigation menus with more than 10 items or pages that offer more than two navigation menus. "If you have a menu on the left, a menu on the right and a menu on the top," he says, "you haven't thought through your design issues well enough."

4. Slo-o-o-o-w pages. No one likes a slow site, and most of the people I spoke with blame the lag on an overuse of graphics. "With two-thirds of Internet users still dialing up by modem, heavy graphics and applets are often a waste," says James Chung, CEO of Beansprout Networks, an Arlington, Mass., company that is developing an online network for parents, pediatricians and child-care providers. "And with many sites constructing customized pages on the fly, slow server response times dampen user interest." In the 1957 classic *The Elements of Style*, William Strunk and E.B. White advise writers to omit needless words. The Web site corollary to that: Omit needless graphics.

A few related nuisances that slow a surfer's progress include music that starts automatically, gratuitous animations, pop-up browser windows that reproduce like Tribbles and "splash screens" that users must view every time they enter your site.

5. Irrelevant (or missing) page titles. There's a reason the title tag exists in HTML. It gives every page a distinctive title, a point that many sites miss. At Wired Digital Inc.'s Wired News—a site that devotes itself to the examination of trends in technology—pages bear non-

A surfer's progress gets slowed by music that starts automatically, gratuitous animations, and pop-up browser windows that reproduce like Tribbles.

descript titles such as "Business News from Wired News" rather than tell you what the story's actually about ("Amazon, Sotheby's Plan Site," for example). That creates a problem when users bookmark those pages; it's nearly impossible to remember what's on the page when you see a vague title in your list of bookmarks, and that discourages people from returning.

Also, when search engines index the site, they typically grab the page title and show that to users in a list of results. A title that says "Acme.com" won't attract nearly as many users as one that says "Acme.com - Products - Roadrunner traps - Pricing."

6. The virtual company. This one tops my personal list: sites that don't list any real-world address or phone number for the company. I understand that companies

are worried about generating more phone calls than they can handle, but they're also thwarting calls from potential customers, business partners and, yes, journalists.

Barry Star, chairman and founder at OneCore.com, shares my pain. He gets peeved "when I want to give a company business, but I can't reach them other than by a Web form. I recently tried to inquire about advertising on a site in a short time frame and absolutely could not find a phone number to call a live body. It blows my mind."

OneCore sets a great example. Click "Contact" on the home page, and you'll find the company's address, phone and fax number, and directions to its Woburn, Mass., headquarters.

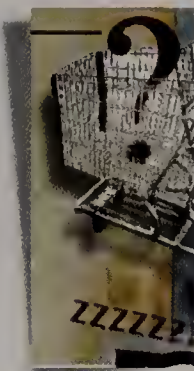
7. Pages that cannot be bookmarked. Companies that use frames to make their site easier to navigate create an entirely new problem. Users can't bookmark the pages they want, and they can't mail a specific URL to colleagues to point them to a particular product page, for example. Forcing users to come in through the front page of your site vastly diminishes its usefulness.

8. No response (or slow response) to e-mails. Nothing turns off users quite like sending e-mails into a black hole.

9. No prominent search option. Internet Concepts' Spencer points out that many Web users are "search dominant." Rather than clicking through every page of your site, they want a search engine to scour the contents for information that's relevant to them. Putting a search box on your home page makes that simple. Webmasters of small sites may find it makes more sense to build a site map or index page to give visitors a comprehensive overview.

10. Password problems. "If I sign up for a site and I have to pick a new user name and a new password, the odds are pretty low that I'm going to remember what I picked," says Jennifer Moss, an executive vice president at Zcentral.com, a division of SDN Online Inc., an online organizer in Hollywood, Calif. "If they don't send me an e-mail reminding me what I picked, it's very unlikely I'll go back to that site. If I do, I'll have to

spend time registering again." Moss, who in her spare time runs a popular parenting site called Baby-names.com, says that using cookies to store user names and passwords on the visitor's computer is one solution, and she predicts that before long sites will accept some kind of universal Web identification card.



Few companies offer a seamless experience to customers who deal with two or more distribution channels.

11. Subpar shopping carts. More annoying than picking the one shopping cart with the wobbly wheel at the supermarket are some of the problems you can encounter with online shopping carts, which let you collect items for eventual purchase. Some sites forget what was in your shopping cart if you leave briefly and then return; others make it too complex to add and remove items, says David Caddis, a vice president of response time management and technology at Candle Corp. in Santa Monica, Calif.

"A lot of sites make using the cart a very tedious process," he says. "That discourages people from buying, and it limits the number of things they want to buy."

12. Channel disconnect. Can your telephone reps help customers with a transaction that began on the Web site? Can your retail staffers handle a return of merchandise that was purchased online? Does your site point customers with more sophisticated needs to a local distributor or reseller? Few companies offer a seamless experience

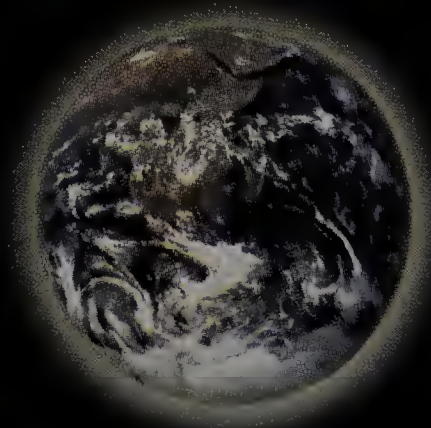
to customers who need to deal with two or more channels of distribution, says Patricia Seybold, author of *Customers.Com: How to Create a Profitable Business Strategy for the Internet and Beyond* (Times Books, 1998) and founder and CEO of the Patricia Seybold Group, an e-business consultancy in Boston.

"We're in a multichannel world, and you need to have a 360-degree view of the customer across all your channels," Seybold says. "The customer will decide—based on convenience—with which channel or channels they want to deal," she says.

Have I missed any of your pet peeves? Crank out a cranky e-mail. **CIO**

Boston-based writer Scott Kirsner also contributes to Fast Company, Wired and The Industry Standard. He can be reached at kirsner@worldnet.att.net.

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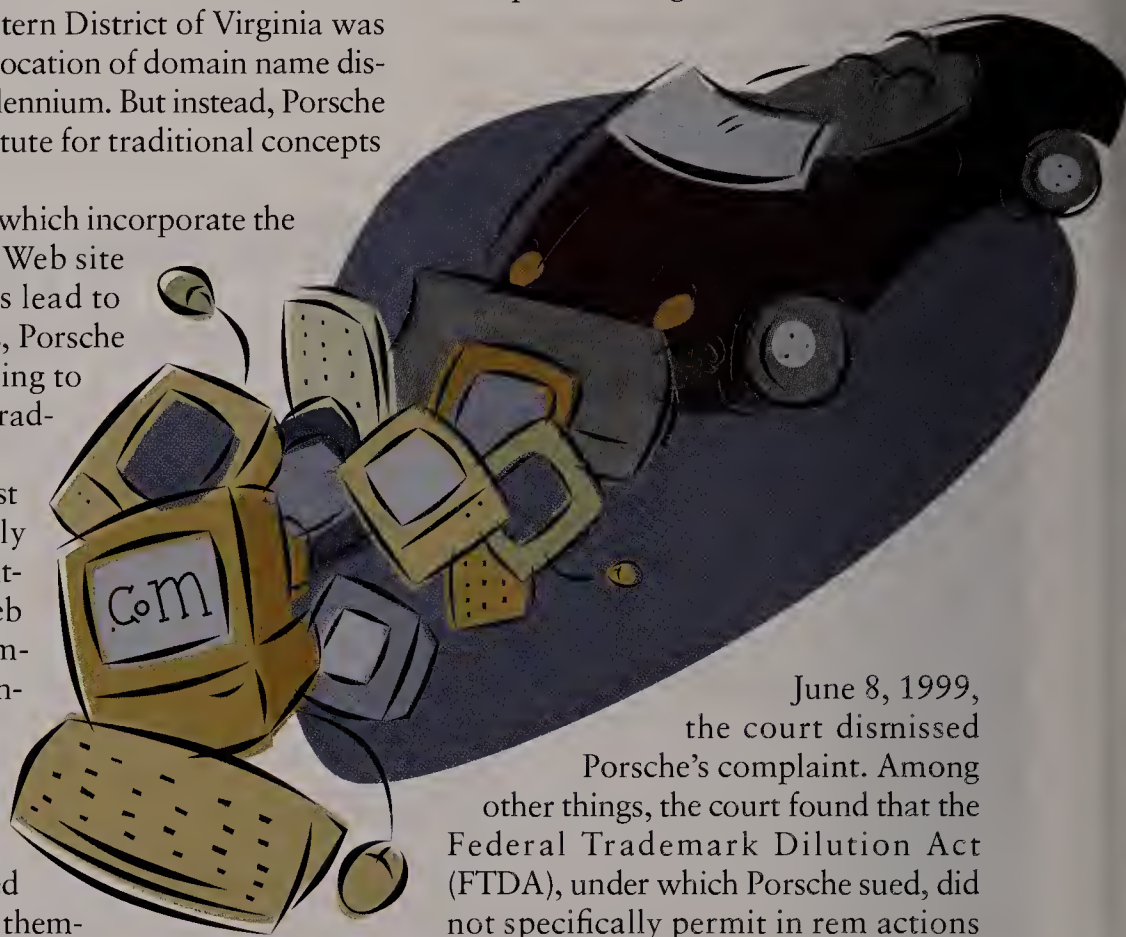
BY ANDREW G. MCCORMICK

ACOURT ACTION FILED IN JANUARY BY PORSCHE CARS North America Inc. in the Eastern District of Virginia was poised to alter the nature and location of domain name dispute resolution for the new millennium. But instead, Porsche may find out there is no substitute for traditional concepts of personal jurisdiction.

Porsche sued 128 domain names, all of which incorporate the Porsche or Boxster trademarks in their Web site addresses. Some of these domain names lead to hard-core pornography sites, while others, Porsche claims, are owned by cybersquatters hoping to make a quick buck or by vendors illegally trading off Porsche's name.

But there was more to this case than fast cars and porn stars—Porsche conceivably had come up with an ingenious way to outwit its virtual adversaries. Many of the Web site owners, according to Porsche's complaint, filed domain name registrations containing false and fraudulent information about their names, addresses and identities, making litigation against such parties a nightmare. Porsche's strategy was to sue not the individuals who had registered the domain names but the domain names themselves. Such legal action is called "in rem" (rather than "in personam"). It sounds bizarre at first, but it wasn't a bad idea. Porsche wasn't looking to recover trademark infringement damages, or at least the German automaker believed it didn't have any realistic chance of collecting against phantom individuals and entities with scant resources other than a few pictures of naked people and a PC. Porsche justifiably wants to protect its name, so an action against the allegedly offending property that gives Porsche control or ownership of the domain names achieves its purpose. What's more, an in rem action, in theory at least, obviates the need to pursue Web site owners all over the world, assuming they could be located, or risk personal jurisdiction problems in any one convenient forum.

Instead, Porsche was hoping that the Eastern District of Virginia—home of Network Solutions Inc. (NSI), the current registrar of all domain names—would provide one-stop, convenient shopping for trademark owners to stop infringing domain names. This efficient package deal sounded great to trademark owners, especially famous mark owners like Porsche, and it may have even sounded good to struggling courts looking for some coherent, manageable solution to thorny Internet jurisdiction questions. But once again, the ultimate "right-under-our-nose-all-along" solution proves too good to be true? On



June 8, 1999, the court dismissed Porsche's complaint. Among other things, the court found that the Federal Trademark Dilution Act (FTDA), under which Porsche sued, did not specifically permit in rem actions and, in fact, by strong implication, seemed not to allow them. The court went on to say that even if it construed the FTDA to allow in rem actions, there were definite constitutional problems with the statute if it was interpreted to affect the property of absent owners.

Two issues immediately surfaced for the court—where is a domain name located for in rem purposes and is such "presence" in the jurisdiction sufficient to satisfy due process concerns? The

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garden-variety in rem case involves tangible, physical property uniquely located within a particular jurisdiction—that is, real property. But where exactly does a domain name exist? Does it have a tangible physical form? A paper representation? Can it exist in more than one place? Ask computer experts, and they might well say that a domain name exists where the Web site it represents is located or, in other words, where the bundle of code comprising a Web site physically exists on that particular Web site's Internet service provider (ISP). That makes sense—a domain name is essentially an address, and if you ask people where their address is, they are likely to point to their home (or home page, whatever the case may be). On the other hand, you could make the argument that a domain name travels with the Web site and can exist many places at once—for example, wherever someone's PC happens to link to that particular Web page.

It's not that far-fetched: Several courts have based in personam jurisdiction over a Web site owner on the mere fact that someone can pull up that Web site at his computer, which happens to be within the particular state. This effectively subjects all potential Internet defendants to in personam jurisdiction everywhere in the world and, right or wrong, supports the argument that a Web site address exists everywhere it can be downloaded.

But minimum contacts for in personam jurisdiction is different from location for in rem purposes. Porsche's contention was that the domain name defendants (indeed all domain names) are located in Virginia in the form of a registry certificate maintained by NSI. This paper representation as an indication of location has some credibility in light of stock certificate and negotiable instrument in rem cases. But the compelling point here is that domain name registrants enter into an agreement with NSI that includes consent to NSI's dispute resolution policy. Their consent gives NSI certain rights and powers, such as putting domain names on hold and depositing domain names with the court. Generally, once a lawsuit is filed, NSI has the power to deposit control of the domain name in the court pending resolution of the matter. It is this deposit

power over domain names and the registrant's agreement to abide by such a system that makes it seem like the domain names' presence might actually be in some Virginia courtroom. A recent case, *Umbro International v. Canada Inc.*, has held that Internet domain names are property subject to postjudgment garnishment under Virginia law. This ruling may have helped the Porsche court reach its rather perfunctory conclusions that the offending domain names in its case are actually in Virginia.

But even though the courts seem to agree that the proper fictionalized location of a domain name is Virginia, simple presence in the jurisdiction is not the

Porsche argued that all domain name defendants were located in Virginia in the form of a registry certificate at NSI.

end of the story. *Shaffer v. Heitner*, a 1977 case, held that the same test of minimum contacts and notions of fair play that govern in personam actions apply to in rem actions. Although *Shaffer* appears at first blush to completely eviscerate actions against property by requiring in-personam-type criteria, in rem actions survived because first, *Shaffer* was really a quasi-in-rem action about property unrelated to the action, which was attached to use as proceeds to cover any recovery by plaintiff, and second, *Shaffer* made clear that the presence of the subject property in the jurisdiction by itself would likely provide the necessary minimum contacts and fairness needed to pass constitutional muster, particularly if the cause of action arose out of the property. What is less clear is whether minimum contacts and fairness issues are satisfied when the property in question, such as a domain name, is intangible, its presence is a fiction or it otherwise exists in uncertain or multiple locations. It was exactly these due process considerations that were the stumbling block for Porsche.

And, though not discussed in the court's opinion, what about practical realities? The Eastern District of Virginia may not have wanted a flood

of litigation in its courts—clearly an incentive to closely scrutinize jurisdiction here. But on the other hand, Porsche may have come across an efficient, convenient forum to resolve all similar disputes, something many courts have been searching for. That has an immediate appeal, but any hopes for lasting precedent have been dashed by the introduction of competition in the domain name registration system. The Internet Corp. for Assigned Names and Numbers (ICANN), the entity charged with the responsibility to coordinate the privatization of the domain name system, had plans to introduce five new competitors to the domain name registration process, originally

scheduled for the end of April 1999, with an eye toward unlimited globalized competition in that area. Thus, there may be more than one location, fictional or real, in which domain names will exist, or at least a different

location for domain names of a particular top-level domain, for example, .com, .org. This undercuts any lasting convenience argument for why Virginia should hear this case. And ICANN will most certainly include a comprehensive, efficient dispute resolution mechanism in the new system, one that may include consent to jurisdiction, which will avoid all these issues.

One final point: Allowing this action to proceed would also have invited all claimants in copyright, trademark or patent disputes to attempt in rem actions in various jurisdictions, most likely in the Eastern District of Virginia, posing difficult practical and theoretical questions. The Virginia federal courts could have become the nation's intellectual property adjudication center—a difficult can of worms for the district to open without careful consideration. So while Porsche may have had a good idea, it needs to find another way to get to the merits of its case. **CIO**

Andrew G. McCormick specializes in intellectual property law at Thacher Proffitt & Wood in New York City. He can be reached at amccormick@thacherproffitt.com. Lisa E. Funk, an associate at TPW, assisted with the research for this article.

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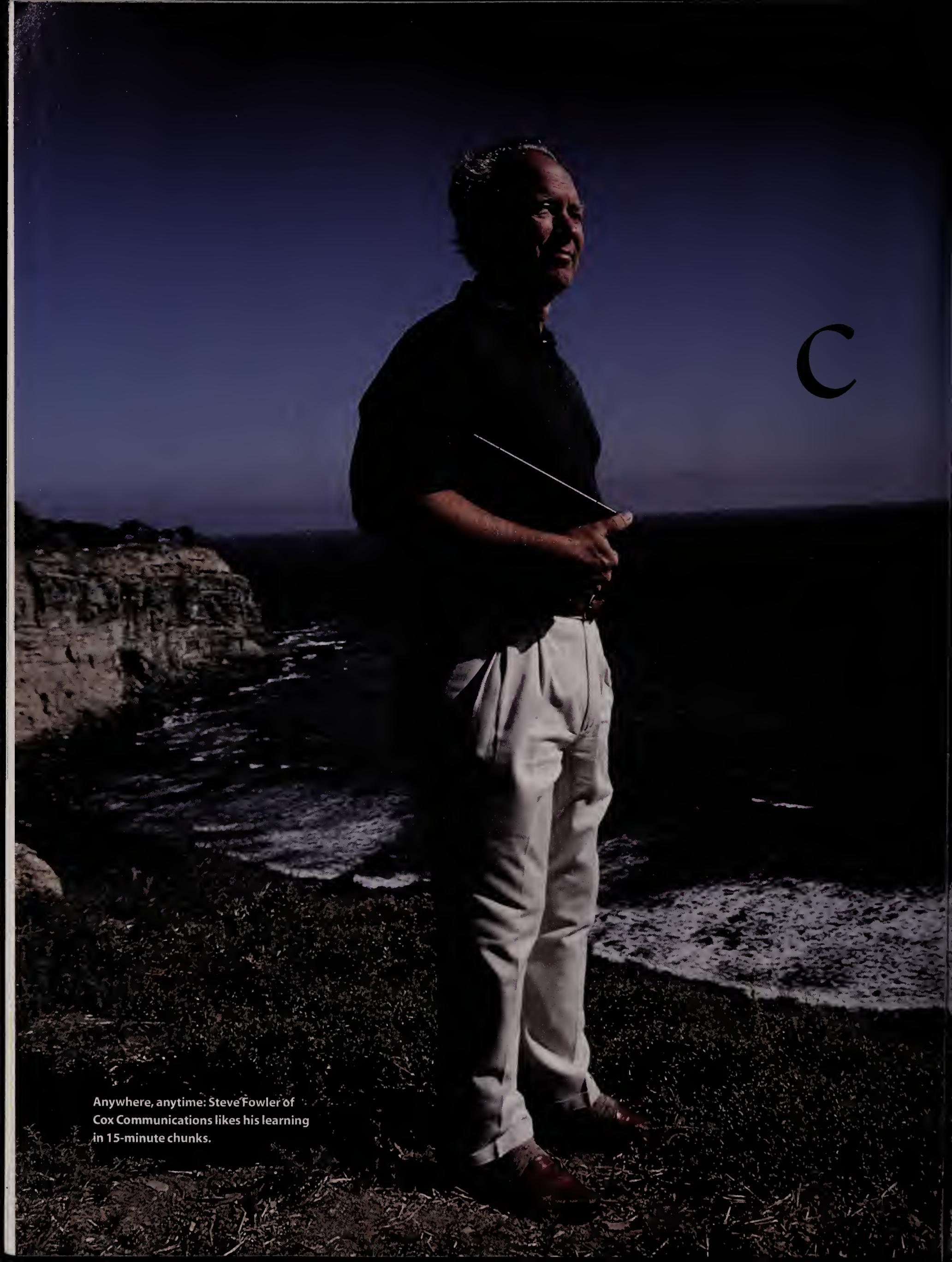
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A man with grey hair, wearing a dark short-sleeved shirt and light-colored trousers, stands on a rocky, grassy shore. He is looking out towards the ocean under a clear blue sky. The scene is brightly lit, suggesting a sunny day. A large, stylized letter 'C' is positioned in the upper right area of the image.

C

Anywhere, anytime: Steve Fowler of Cox Communications likes his learning in 15-minute chunks.

Without books or classrooms, virtual corporate universities promote learning among employees

BY ANNE STUART

Continuing ED

STEVE FOWLER HAS LEARNING FOR BREAKFAST.

The general manager and vice president of a Cox Communications Inc. cable system near Los Angeles starts each workday with a 6:30 a.m. class. Fowler's office is his classroom. He's the only student. And the class lasts just 15 minutes—or until the day's job demands pull him away from his desktop computer.

"I like it because I can go at my own pace," Fowler says of the courses he's taken over several months through Cox University, his parent company's in-house Web-based employee training program. As the head of a busy 100-person company handling cable TV installations and service for Los Angeles County, Fowler can't justify setting aside hours or days for traditional computer-skills classes. But he *can* spare 15 minutes a day, which is how he prefers to attack his subject matter. In that quiet quarter-hour per day, he's taken an integrated approach to mastering a variety of applications, including Microsoft Excel, PowerPoint, WordPerfect, computer graphics and other programs.

Cox University doesn't fit the dictionary definition of a university. It's got no campus. It offers no degrees.

Reader ROI

TRAINING TOPS MANY COMPANIES' strategies for outpacing their competitors and luring and retaining the best employees. It's also a major expense. Read this story to learn

- The difference between corporate universities and traditional training programs and why virtual programs are on the rise
- How companies use the Web to educate a global workforce
- Which subjects work well online and which still require a human touch

PHOTO BY KAREN MILLER

School Spirit:

Anna Young developed an online guide for employees at Cox Communications.

It admits only students who work for Cox, an Atlanta-based media and Internet services company. But like a growing number of such programs, Cox University views itself as an institution of learning rather than just a company training department. The distinction, proponents say, is that a corporate university coordinates all in-house learning, including technical training, management seminars and workshops on balancing family life and work. Typically such programs offer centralized, coordinated and progressive curriculums designed to help employees learn corporate culture, skills for improving performance in current jobs and knowledge to help them advance their careers.

More than 1,600 companies, including nearly half the Fortune 500, maintain corporate universities, according to Corporate University Xchange Inc., a New York City-based consulting and educational research group. Nearly all such programs offer at least some classes in the traditional way—on set schedules and led by instructors in classrooms. But like Cox, 90 percent have gone virtual as well, offering at least some classes online, primarily through the Web, but also via

videoconferencing, CD-ROM and other technologies.

It's debatable whether any in-house corporate training program qualifies for the "university" designation, particularly given how unevenly companies have applied the term in the past. Motorola Inc., for instance, has always referred to its groundbreaking training center as Motorola University. But then there are tongue-in-cheek uses, such as Dunkin' Donuts University in Braintree, Mass., a five-week offsite training program for new doughnut-shop managers, and Hamburger University, the McDonald's Corp. training center in Oak Brook, Ill., which offers a two-week course in "hamburger-ology."

Still, proponents of the corporate university concept insist their programs are more than dowdy, old training departments decked out in new duds. Jeanne C. Meister, president of Corporate University Xchange, sums up traditional company training efforts in one word: fragmented. Typically, she says, those programs offer no companywide strategy and little—if any—coordination among courses. Companies might offer a half-dozen courses on one general topic for different in-house audiences and nothing at all on another subject. Traditional



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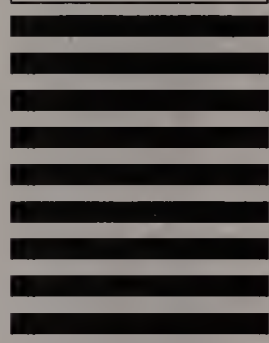
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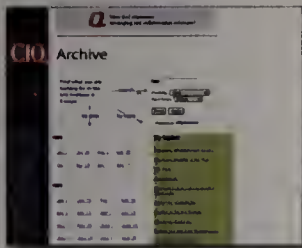


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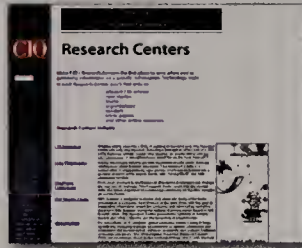
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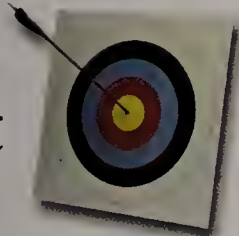
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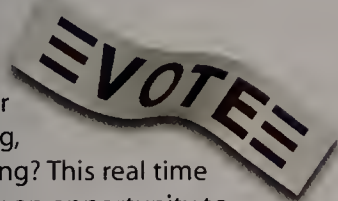
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COVER STORY: CORPORATE LEARNING

training departments also lack an organized curriculum for advancement. Corporate universities, in contrast, coordinate all training and education, often offering a progressive curriculum directly related to current job performance and future career goals.

That approach creates a cohesive, centralized strategy, fills training gaps and eliminates duplicate or irrelevant classes, says Meister, also author of *Corporate Universities: Lessons in Building a World-Class Work Force* (Irwin Professional Publishing, 1998). "We have seen instances where companies have gone from 3,000 offerings to maybe 1,200," all tied to specific jobs or company goals. Successful corporate universities—online, on campus or both—view their efforts as a process, she says. "It's less a place to go to for training than a metaphor for continuous learning."

Subscribing to the "if you want it done right, do it yourself" theory, many high-level executives have gotten deeply involved in developing their companies' corporate universities. In surveying 120 executives at companies with established corporate universities, Meister's group found that 83 percent had spoken publicly about their importance to their companies' success. Conoco Inc. President and CEO Archie W. Dunham, for instance, has said that Conoco University helps the Houston-based oil and gas company achieve his top priority of strengthening leadership skills companywide. A third of the 120 companies surveyed said their CEOs either personally

teach or lecture in their own corporate universities. Such hands-on involvement may explain the sharp increase in financial support for corporate universities: an average annual budget of \$17 million, up from \$13 million in 1998.

Meanwhile, companies increasingly look to technology to make sure employees learn what they need as soon as—or before—they need it. At least 90 percent of those 1,600 corporate universities offer at least some virtual training. Some, like Fowler's courses, are self-paced; others may be offered in real-time via videoconferencing, live chat or other technologies. Researchers expect the percentage to climb because the concept fits neatly into a knowledge-based economy, according to Meister and other corporate university proponents. "It creates a learning environment where you don't just stop and take a week off or two weeks off for training," says Al Gordon, program manager of Siemens Virtual University at Siemens Information and Communication Networks Inc. (ICN) in Boca Raton, Fla. "It's a constant thing."

What's driving demand in virtual education? Need and availability, says Brandon Hall, editor and publisher of the *Multimedia & Internet Training Newsletter* and author of the *Web-Based Training Cookbook* (John Wiley & Sons, 1997). "There's the need to train more people on more topics, to do it faster, to do it on a worldwide basis and to do it cheaper," he says. "On the availability side, the technology now allows for providing training anytime, anywhere, to allow people to

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go through it at their own pace, to skip the sections that aren't relevant to them and to repeat sections if they need to."

Most employees with desktop computers know how to use a browser, so they need no instruction or new software to take Web-based classes. And companies save a bundle—40 percent to 60 percent annually, Hall says—on the expense of making employees travel elsewhere for training. Siemens, for example, saved \$1 million on training-related travel in a single year.

A Web-based curriculum also provides a nifty tool for creating a unified culture—particularly important as companies grow, merge and globalize. That's not just to whip up team spirit; it's to create agile companies that can get information to widely dispersed teams and respond quickly to marketplace shifts. "The world is changing so fast," says Steven Tallman, who, as worldwide director of training at Boston-based management consultancy Bain & Co., directs Bain Virtual University. "We need to get the very best thinking from Tokyo online so that someone in Brussels can take advantage of it. The virtual university gives us a platform to do that."

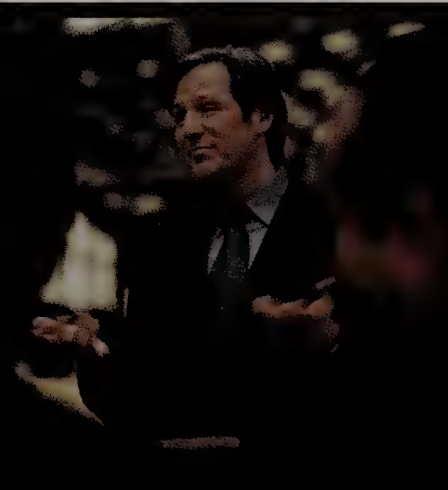
As with distance learning in general, there's a downside to Web-based training, whether or not it's coordinated under the

corporate university umbrella. For starters, some subjects simply don't translate to the Web. It's tough to imagine an effective online course about, say, coping with downsizing or preventing sexual harassment. Those topics require too much nuance, too much sensitive discussion, to be handled well online. And some subjects, such as a router-installation class

Corporate universities coordinate all training and education, often offering a progressive curriculum directly related to current job performance and future career goals.

taught at Siemens' real-world training center in Irving, Texas, simply require students to have their hands on something besides a computer keyboard. (On the other hand, the Web can supplement or update such efforts, Siemens' Gordon notes. By putting some of the information online, "we may be able to shorten a class from four to three weeks or get everybody through the first level before they arrive so that they can focus on the lab work.")

Then there's the initial expense. Companies often must invest heavily upfront in expertise, infrastructure and course development. Typically it takes about 100 hours of develop-



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All Around the World

For Conoco's David Nelson, the corporate university had to have a global focus.

ment for every hour of instructional time in courses where teachers and students work together over the Web at the same time, Gordon says. For full-scale multimedia offerings, the ratio can run as high as 400 to 1. (Developing asynchronous classes where students attend courses by themselves on their own time take less effort, according to Gordon.)

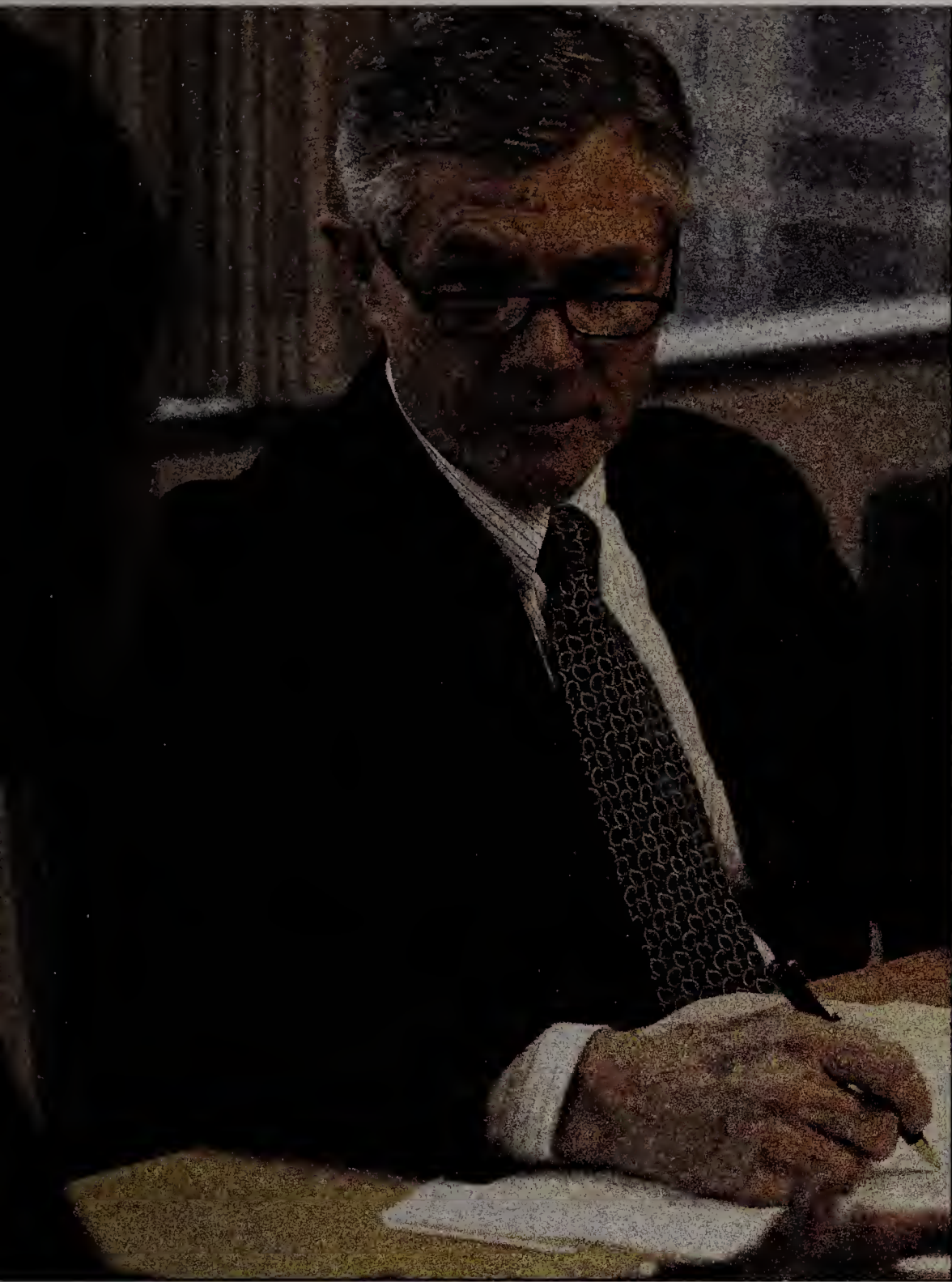
But the most controversial issue is how well or even whether students learn on their own. Skeptics insist people learn better from people, period. "People need to get out of the office to learn," says Steven Heckler, president of Arlington, Va.-based WestLake Internet Training, which offers classroom-based courses on technical topics. "They need to have real interactivity"—not with their computers, he says, but with human instructors and classmates, in person, in real-time. That way, they get immediate answers to their questions and learn from each other as well as from the instructor.

Heckler, who hasn't taught or taken classes online, says a good classroom instructor can adjust the course's pace and tempo in a way the Web just can't. As an instructor, he says, "I'm connected to students emotionally; I can sense their con-

cern. When there's something they like, I can key into that. When I have students who are drifting, I'll gently direct them back to the material." And, he says, students who learn in person tend to remember more material than those taught online.

Despite their drawbacks, virtual corporate universities are likely to flourish simply because they offer learning options for a business world changing at the speed of light. As Gordon notes, trends and technology often change too fast to be incorporated into classroom instruction. "You can't [develop] it quickly enough," he says. "By the time you do, you've got to revise it, and then all the money you've spent is thrown out the window."

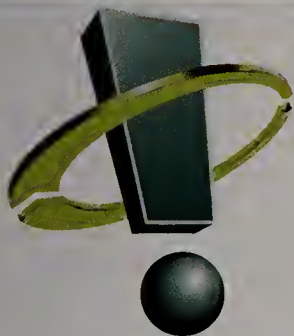
For that reason, Hall recommends that companies wanting to experiment with virtual corporate universities start small but start soon. "The biggest mistake is waiting," he says. "People need to move forward with the technology now. The leading organizations are doing this. The smallest organizations are doing this. The world is changing very fast. This helps you change with it." Read on for profiles of organizations that have developed virtual universities over the Web.



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Bain Virtual University Going Global

Saving big bucks on training often ranks as the top reason that companies launch virtual corporate universities. At Bain & Co., that issue didn't even make the list. "We specifically said we're not doing this just to reduce costs," recalls Steven D. Tallman, worldwide director of training for the Boston-based management consultancy. Instead, Bain wanted to create a central, consistent, constantly updated learning source available to all employees all the time.

Before launching Bain Virtual University (BVU) in June 1998, the global company kept training strictly local, with offerings sprinkled among 25 offices worldwide. There was no central oversight; Tallman's job didn't yet exist.

That scattershot approach wouldn't cut it in the current high-speed, high-stakes economy, and Bain executives knew it. "Our job is telling clients what they should do. We need cohesive training to do that well," Tallman says. Stephan Roche, a San Francisco-based Bain manager, couldn't agree more. "It's so critical to differentiate Bain from its competitors by making the people who work at Bain a heck of a lot smarter," he says. Roche, who visits the Web-based BVU regularly, says it compresses and packages knowledge "so that you get excellent learning on a very efficient timetable."

BVU also helps create a single global corporate culture, encouraging employees everywhere to do things "the Bain way." So if consultants need information on Bain's approach to merger integration or to working with companies in a high-growth phase, they'll find it on their desktops. And if a performance review recommends brushing up on particular skills—giving a presentation or leading a meeting, for instance—employees can get started on their self-improvement work online.

BVU has no instructors. Its 150 courses are offered mainly as PowerPoint presentations with HTML links or as interactive video. But there is a human element: a "peer finder" that lets students contact the colleague who prepared the course materials or somebody else with expertise on the topic.

The university also functions as a headline news service for new ideas. "When somebody has some breakthrough thinking on a topic, we can videotape them, put it online and then send an e-mail around letting people know it's there," Tallman says.

Bain also uses BVU for "homework" before face-to-face

training, including the intensive week-long retreats most employees attend annually. The prep work frees retreat participants to spend their time together on meaty discussions, such as specific case histories, rather than the general information covered online.

Courses, called modules, cover a wide range of topics,

including case histories, records management and advanced database design. The offerings represent more than 10,000 hours of development time, about a third spent converting existing course materials and the rest creating new ones. Most modules can be mastered in 20-minute chunks, the average amount employees can spare in one sitting.

More than 2,000 of the company's 2,500 employees have visited BVU, a response Bain credits to the 11-member training team's no-holds-barred marketing push. Tallman and Project Manager Nina Antolino visited Bain offices worldwide to demonstrate their project, pick pilot-team members, and distribute posters and brochures promoting BVU.

And they listen to users. "In release 1.0, we kept records of the things people searched for on BVU and couldn't find," Tallman says. "We added the top 15 of them to the next release." New choices included numerous soft skills courses, such as brainstorming, finding a mentor, planning workload and managing stress; additional information on

Bain history, values and culture; and new modules on handling mergers, designing databases and a dozen other topics.

The main goal: "To keep quality high so that they'll keep coming back," Tallman says. Repeat business is, in fact, BVU's mission; the university's motto, *discere perpetue*, translates to "continually learning."

Cox University Better Learning Via the Web

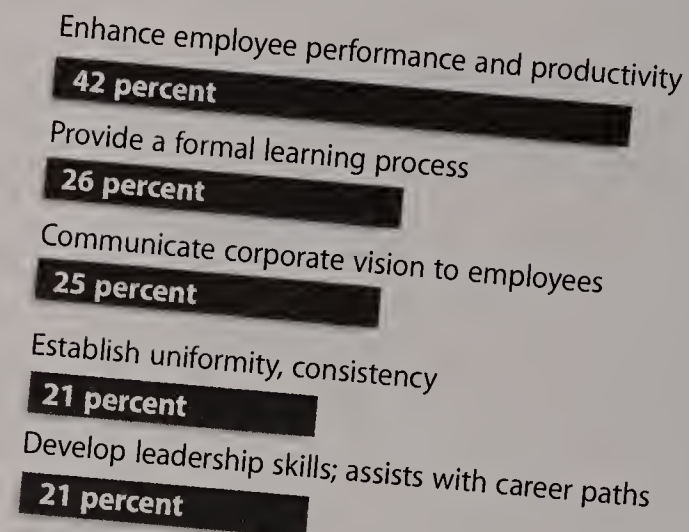
We should all have results like this.

Cox University, the Web-based corporate training program for Cox Communications, was launched in July 1998. Within two months, the program had paid for itself in savings, mostly on travel costs for employee training. Then Cox University Director Anna Young developed a fast-paced, easy-to-use online guide for employees selling Cox@Home, the company's residential Internet service. The effort took two months of Young's time and \$1,000 in sales incentive prizes, resulting in more than \$4 million in new Cox@Home sales—in one month.

That cause-and-effect relationship with the business forms

What Good Is It?

Percentage of executives at companies with corporate universities who believe those efforts



*Percentages based on survey responses by 120 executives at companies with corporate universities.

SOURCE: CORPORATE UNIVERSITY XCHANGE, 1999

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the very foundation of Cox U, which serves 50,000 employees in 200 locations. The virtual university's mission is, simply, to help Cox Communications meet its business goal, primarily becoming the leading telecommunications and media company in its markets. For that reason, every one of Cox University's 150 courses is tied to a job category, a business strategy or a product.

For instance, Young designed the sales course specifically for the 152 employees who sell the Cox@Home service. Rather than parroting generic sales techniques, the self-paced course compares Cox@Home with its closest competitors' services, feature by feature, addresses specific customer objections and offers closing tips. For example, the customer may say, "I need to talk to my wife before I decide anything." According to the course, the sales rep should respond this way: "Why don't we go ahead and schedule an appointment now? That way, we'll be all set when you do talk to your spouse."

Of course, Cox could brief its salespeople in a traditional face-to-face class. But "it's very difficult for us to pull people away from their desks, away from their selling, to put them in a classroom for training," Young says. There's less impact on the bottom line when students absorb the same information at their leisure and at their desks, taking a 20-minute interactive video segment here or a 10-minute online pop quiz there.

Cox matches certain courses with certain jobs, allowing ambitious employees to pick classes likely to help them move up. The university tracks and records students' progress, even bookmarking their spots if they can't finish a particular segment in one sitting. Other course choices include a variety of technical applications, certification for Microsoft and Cisco programs, and all new Cox products and services. The longest course lasts two full days; the shortest, about two hours.

Cox, which still offers some classroom courses, created and launched its virtual university in just four months, including a six-week pilot test in 15 locations. A virtual team consisting of employees at Cox facilities in several states handled development. An existing corporate intranet was used as the platform, which speeded the product launch.

Conoco University Not Your Standard Classroom

Conoco Inc. faced the same questions as every other company considering opening a corporate university: Go with a brick-and-mortar training center, create something virtual or combine the two?

"It was a fairly easy decision, really," says David J. Nelson, manager of organization development for the huge oil and gas company. "We are a global corporation that happens to have a Houston headquarters. The university had to live in the conference rooms and corridors of Conoco around the world, not just be an initiative from Houston." With 15,000

employees in 40 countries, Conoco provided a textbook argument for a virtual, asynchronous learning environment. "What we wanted to do was move away a little bit from the standard classroom," says Nelson. "For so long, it's been, 'Go away somewhere and learn, then come back and act.' We wanted to do the learning and the acting at the same time."

Conoco University offers intranet-based learning modules on three key themes: executive development, shared purpose and direction, and fundamentals for the future. The executive curriculum, open only to the company's top 200 to 300 leaders, offers high-level leadership training. The shared-purpose courses, open to all employees, focus on Conoco's overall vision, strategies and operations. And the future-oriented program provides training in areas that Conoco's top management considers critical to the company's

future. Those areas include business literacy, effective Internet use, supervisor excellence and personal leadership skills.

Conoco University also offers online support for the company's much-praised Learning Labs, where small, diverse groups develop their leadership skills over six to nine months. Each participant brings the group a challenge or problem from his or her business unit; together, the group creates a solution for each of its members. Between meetings, they can go online to find resources such as management books and software, reports from other Learning Labs worldwide, and a chat forum where participants can ask questions and share best practices.

Executives at Conoco, as at other major corporations, say they'll probably always offer some classroom-based courses. But they expect competitive pressures will continue to force them to experiment with new ways to provide relevant, up-to-the-minute training. "It's so easy to become 'ivory tower' and get out of touch," Nelson says. "A university has to stay connected to the real business of the company. It must be part of the absolute fabric of the organization." **CIO**

Senior Editor Anne Stuart can be reached via e-mail at astuart@cio.com.

By Definition

Corporate University: An educational organization established and run by a corporation and serving as the umbrella for all company training and education. More than 1,600 companies maintain corporate universities. Average budget: \$17 million.

Virtual Corporate University: A corporate university offering training through technology rather than in traditional classroom settings. More than 90 percent of corporate universities deliver at least some virtual courses, primarily via the Web, but also through videoconferencing and other methods. Courses may be self-paced or offered in real-time.

Web-Based Training: Courses delivered partly or completely via the Internet, an intranet or an extranet. The U.S. market for Web-based training will exceed \$6 billion by 2002, according to International Data Corp.

SOURCE: CORPORATE UNIVERSITY XCHANGE, INTERNATIONAL DATA CORP.

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Internet2 . . .

and Counting

Researchers are hard at work on the next version of the Internet. What they develop will have a huge impact on network applications and the way they are managed.

BY ROCHELLE GARNER

JUST BECAUSE THE COMMERCIAL WORLD has taken over the Internet, academic and government researchers had to go off and build their own private network and dub it Internet2. Here we sit, with our noses pressed to the window, while they tap into what is now the world's fastest wires for their esoteric investigations into things like prehistoric weather patterns. It's as if all the commercial activity on the Internet has polluted the network that academics and the government originally developed for their own use.

There's just one problem. It's not true. Contrary to popular belief, the so-called Internet2 project isn't a separate network of trenches and fiber meant to keep out the commercial masses. Nor will there ever be two Internets that crisscross the

globe. Instead, think of Internet2 as a giant test bed, where more than 200 universities, government researchers and high-tech companies participate in research, with their efforts coordinated by the University Corporation for Advanced Internet Development (UCAID, www.ucaid.org) in Washington, D.C.

UCAID's goal: to develop fundamentally different technologies that can be dropped into the current Internet protocol infrastructure as they become ready for prime time. Internet2 participants emphasize *fundamentally different*; research initiatives go beyond boosted bandwidth to include middleware, protocols and, most important, new Internet applications that duplicate and even improve upon face-to-face interactions.

Such applications, already in prototype, bear little resemblance to what the world has seen: three-dimensional CAT scans that show a brain in mid-thought; live feeds from upper-atmosphere observatories that let astronomy students look and listen as leading experts discuss what they see; virtual-reality-residing design studios that dissolve barriers of time and place, allowing better collaboration among global teams.

If unleashed over public networks, these bandwidth-hogging applications would bring the current Internet to its knees. Internet2 is the venue where such high-performance network

Reader ROI

IN THIS STORY ABOUT THE advanced network research project known as Internet2, learn

- ▶ How initiatives will affect the future of commercial Internet applications
- ▶ What CIOs can do to prepare for upcoming applications based on Internet2 research

ADVANCED TECHNOLOGY

applications can be tested. "This is an experimental infrastructure running experimental research-oriented traffic," says J. Gary Augustson, vice provost for information technology at Pennsylvania State University in University Park, who previously chaired the steering committee that launched Internet2 in 1996. "This isn't for aggregated e-mail or putting Christmas movies online. It's a concerted effort to shorten the development life cycle of the next stage of Internet products," he says.

According to many researchers associated with Internet2, technologies being worked on now will begin to find their way into commercial products by the end of 2000. "Public networks are approaching a state of operation where they look, act and feel like private networks," says Guy Cook, vice president of Internet2 services at Qwest Communications International

Inc. in Denver. Private, value-added networks are speedier and more reliable than today's public networks but are

CIOs can soon turn to the massive telecommunications companies to deliver those capabilities on the public infrastructure." Eventually, the Internet as we know it will be replaced piecemeal as new technologies and components derived from Internet2 get commercialized. The result for the world's businesses is that everything changes—from strategic business models to business processes and staffing skills. Companies will have to rethink how they work, how they build and sell products, and how they manage their network assets. In an age of



The Internet as we know it will be replaced piecemeal as new technologies and components derived from Internet2 get commercialized.

also more expensive. Beefing up the Internet with technologies that can replicate the performance of private networks will be a significant advancement in networking technology, says Cook.

"That completely changes the economics," he says, "because instead of having to construct a private network,

Internet time, it becomes even more critical to understand high-speed network technologies and the capabilities they will enable.

What's Up? The Internet2 project is exploring a host of technologies related to the fast and reliable transmis-

THREE OUT OF FOUR FAIL TO MEET



sion of video and audio. Two such technologies—multicasting and differentiated quality of service—could be among the first to make it outside the research lab.

The notion behind multicasting is sending a single stream of video or audio across the Internet and then, at the closest common point on the network, copying it to different computers requesting that same stream. The result is vastly improved network performance because each individual computer doesn't have to query the originating server separately for data.

Then there's differentiated quality of service, or diffserve. Today Internet transmissions are "best effort"—packets get there when they get there. That's not a problem with e-mail messages, which don't have to be delivered instantaneously. But packets in a videoconference stream need to reach their destination without even a millisecond break. Diffserve would take care of the issue by assigning levels of priority to different

types of packets. Combined, the two technologies will allow the intercast of both live and on-demand, TV-quality video and audio. That may not seem like much, but it's revolutionary because it will reduce—if not eliminate—the confines of both time and space. And that's the overarching focus of Internet2.

"The key to this whole exercise is applications, not infrastructure," says Terence W. Rogers, who—as director of the 2.4Gbps backbone known as the Abilene Project that connects Internet2 members—oversees the fastest infrastructure component ever to link U.S. universities. "The whole point of the infrastructure is to allow the development of experimental, multimedia applications as a way to stimulate the commercial sector to deploy more bandwidth."

The rationale, Rogers says, is to crack the chicken-egg conundrum. Today commercially available broadband capacity is expensive, primarily because few applications demand it. But no one's writing bandwidth-consuming applica-

tions, since there's no way to run them. "We hope that by encouraging people to create experimental applications, we'll stimulate the commercial sector to deploy more bandwidth," says Rogers.

What Box? The applications developed for Internet2 themselves seem lifted out of Star Trek. Consider, for example, the virtual reality "cave" developed at the University of Illinois. Everyone wearing the requisite VR goggles, no matter where they are, sees the same 3-D images projected on a wall. Onscreen (or is it onwall?) adjustments and changes are seen by everyone.

Or imagine a videoconference in which the images of participants are captured by a 180-degree surround camera and then projected thousands of miles away onto a wall. Life-size. With directional voice. "It's like being there," says John Patrick, vice president of Internet technology at IBM Corp. in Somers, N.Y. "I think of these applications as natural-net rather than Internet."

OUR IT INITIATIVES EXPECTATIONS

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If you're counting on superior technology to swing the odds in your favor, consider this: Most initiatives don't fail because of inadequate hardware or software.

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Not surprisingly, nearly all of the experimental applications now in prototype have an educational focus such as distance learning. But the combination of high-bandwidth, full-screen video and CD-quality audio creates extraordinary possibilities for business use too: Visualize stock market data in 3-D. Test drive cars before they're built. Reach out to customers with full-length, high-quality video presentations at their desktops.

This isn't so much as thinking outside the box as it is demolishing the box. The ramifications for commercial use could be far-reaching. "By 2000, we will see some businesses using these capabilities as a competitive edge to gain market share and customers," predicts Joe Mambretti, director of the International Center for Advanced Internet Research (iCAIR, www.icaire.org) at Northwestern University in Evanston, Ill. (iCAIR works jointly with UCAID on Internet2 research projects.) "These technologies will change whole business strategies in how companies define themselves."

Of course, for all of the blue-sky concepts to come to fruition, honest-to-God products that incorporate multicasting and diffserve technologies must hit the market. That means products from the likes of Ameritech Corp., AT&T Corp., Cisco Systems Inc., IBM Corp., Lucent Technologies Inc., MCI WorldCom Inc., Nortel Networks Corp. and Qwest. These represent many of the heaviest hitters in the Internet telecommunications arena, and all are corporate Internet2 members. As such, each has pledged more than \$30 million to Internet2 research over the life of the project. Each undoubtedly expects big returns.

Take Qwest, for example, which donated 11,000 miles of 2.4Gbps (OC-48) capacity on its nationwide network. Value of the donation: \$500 million. But Qwest didn't just hand over bandwidth and step back. The company is working shoulder to shoulder with all of the other members to learn firsthand what and how things break at super-fast speeds. "Qwest doesn't do a lot of direct R&D; what better place to get advanced applications from?" says Qwest's Cook. A big plus of Qwest's participation in Internet2, says Cook, is observing how sufficiently different networking equipment such as routers and protocols work together. Cook says Qwest will edge out compet-

ing vendors by directly applying its Internet2 gleanings to its existing infrastructure. "We plan to be very aggressive in getting AT&T customers to move from their expensive traffic transmissions to us," Cook says. (Of course, fel-

IT organizations must embrace the new world of directory-enabled applications to manage and coordinate the new Internet.

low Internet2 member AT&T has its own ideas about keeping and gaining customers.)

Even companies that do a lot of direct R&D are involved with Internet2. At IBM, the mantra for the decade is "e-business." And why not? IBM has generated nearly 25 percent of its 1998 revenues of nearly \$82 billion from hardware, software and services related to the company's e-business offerings. With that kind of money at stake, IBM has good reason to participate in just about every major initiative of the Internet2 project. IBM is learning how to manage and monitor ultra-fast networks for authentication, security, accounting procedures, performance monitoring and network management. Members of IBM's Global Services consulting practice are currently immersed in Internet2 research projects, says Patrick. He expects Big Blue to offer equipment using Internet2 technologies within the next 12 months. Among the specific Internet2 initiatives IBM is touting are high-speed, video-conferencing and distributed network storage.

What Now? Is there anything CIOs can do now to prepare? Yes and no. No, in that nothing is yet available to buy or contract for. Yes, in that now is the time to plan for the coming Internet2 revolution.

"The level of competency an IT organization needs in the network arena

is the biggest issue to deal with," says Erv Blythe, vice president of information systems at Virginia Polytechnic Institute and State University in Blacksburg. "The network becomes the vital infrastructure, and that means there will be a premium on hiring people with networking skills, maintaining their knowledge and retaining them."

Blythe should know. As an IS executive of an Internet2 member, he's among the first to see how IT organizations must change and adapt. Among his discoveries: IT organizations must embrace the new world of directory-enabled applications to manage and coordinate the new Internet. "A few years ago, CIOs spent their time with the database management system," says Blythe. "Now, they have to turn their attention to directory management for assigning levels to users and for establishing policies in how people and data move through the network."

And finally, Blythe advises, all assumptions about the networking industry are off. Think you know who the leaders in networking and telecommunications are? They might not be the dominant players eight months from now. "We'll see some awfully big players drop out of the Internet communications arena, and some unknowns take their place," says Blythe. "So you have to keep your options open—don't think in terms of many-year partnerships. And always keep the number-two and number-three guys on your radar." **CIO**

Rochelle Garner is a freelance writer based in San Carlos, Calif. She can be reached at rrgarner@pacbell.net.



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decoding DEATH

In laboratories all over the globe, researchers are racing to unlock the secrets of genetic codes. In one, the Internet sets the pace.

BY ART JAHNKE

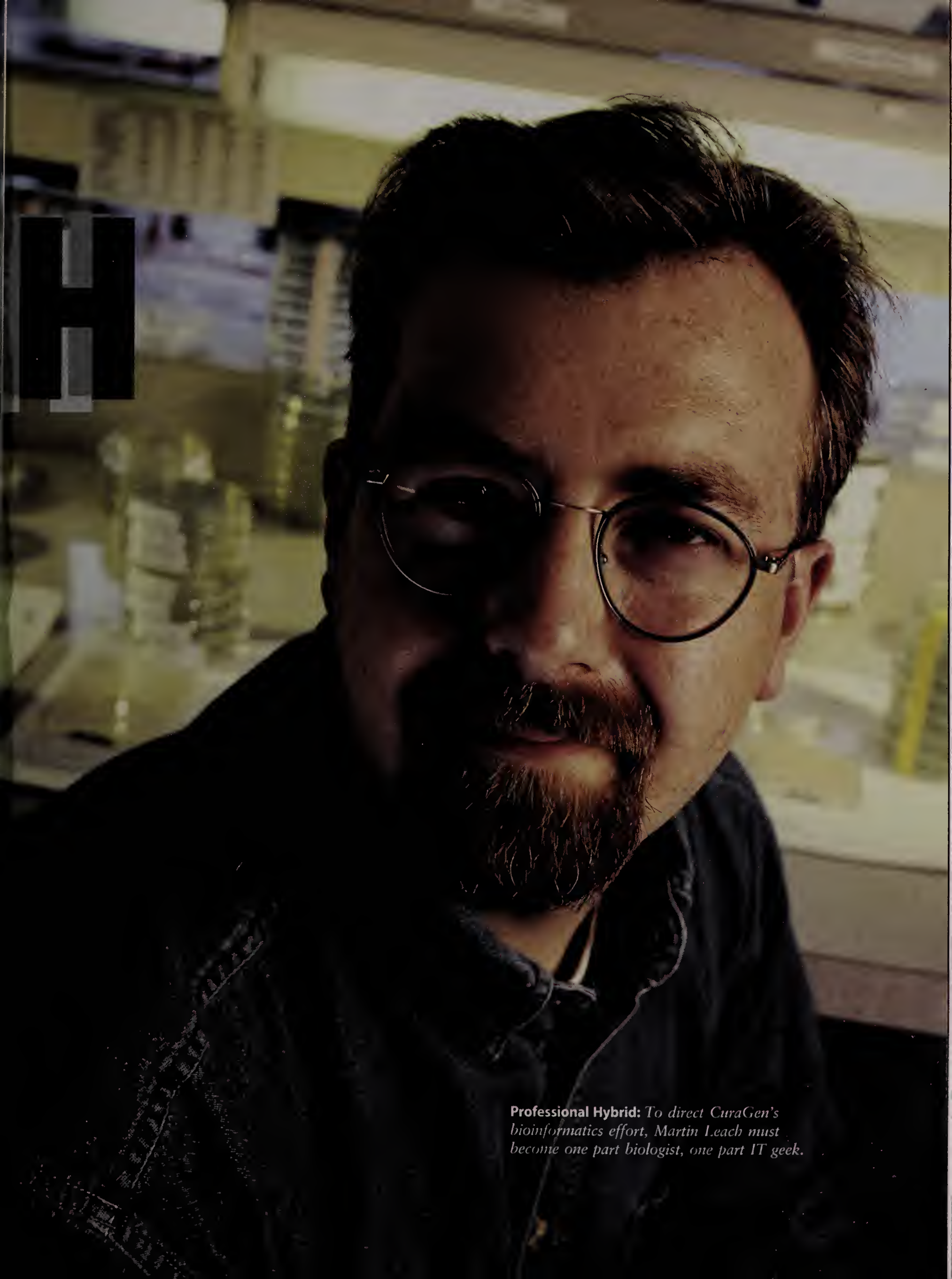
It was a curious way to die.

On farms all over Texas, the same grim scene was playing itself out. Horses were acting in strange ways, walking into objects or staggering about, unable to place one foot in front of the other. Eventually, they showed no interest in eating. Finally, of course, they fell dead. When they were autopsied, veterinary doctors found something that could have come from the latest *X-Files* episode. Their brains, normally a hard mass of tissue, had turned to liquid. State veterinary authorities were called on to explain to farmers what exactly was happening.

Reader ROI

IN THIS STORY, READERS WILL learn

- ▶ How genetic researchers have put the Internet to work
- ▶ How Web technology spared a startup from seeking venture capital
- ▶ How binary code and genetic code work in similar ways



Professional Hybrid: *To direct CuraGen's bioinformatics effort, Martin Leach must become one part biologist, one part IT geek.*

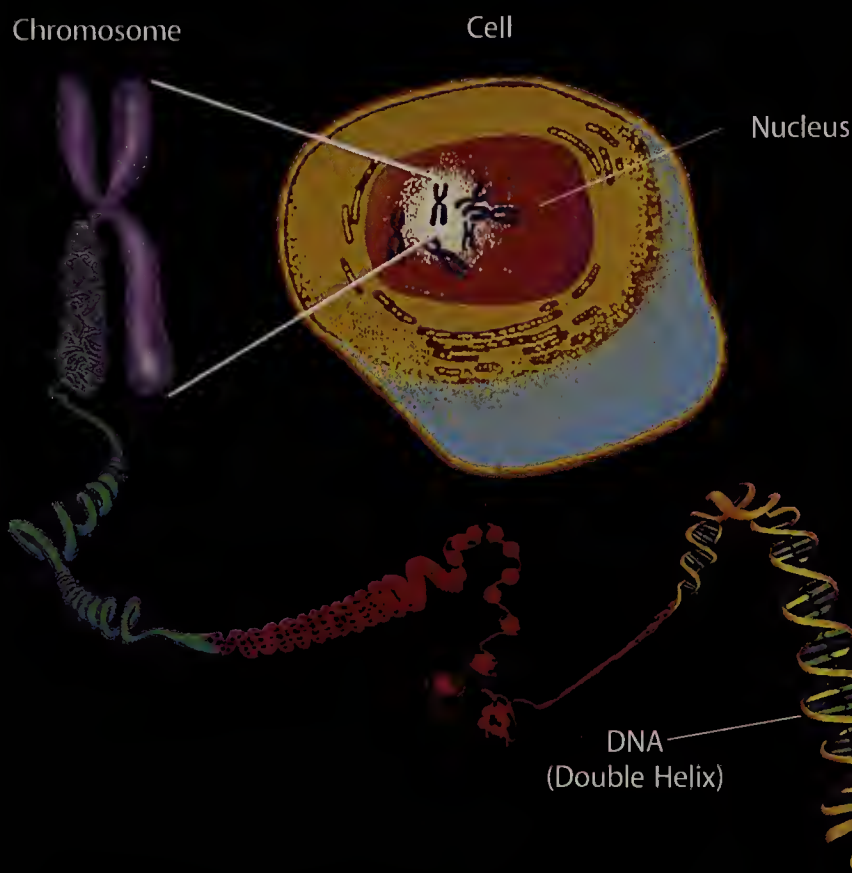
weird science

A refresher course in Biology 101

Genetics: The study of how particular qualities or traits are transmitted from parents to offspring.

Gene: A unit of hereditary information that must be copied and transmitted from each cell to all its progeny.

Genome: The complete set of genetic information contained within a cell. It consists primarily of the DNA and includes all of the information required to guide the development from a single fertilized cell to a full-grown organism.



Chromosome: A microscopic rod-shaped body that carries all genes that convey hereditary characteristics.

DNA (deoxyribonucleic acid): The basic material found in chromosomes. DNA is in the shape of a double helix, which looks similar to a spiral staircase. Chemically coded within the DNA are instructions for producing all of the proteins needed by a cell.

RNA (ribonucleic acid): A single strand made up of millions of minute subunits called nucleotides. RNA appears as half the spiral staircase, split down the middle.

Protein: Construction material produced by the cell, following specific instructions by genes. Proteins determine what a cell looks like and which specific functions it will perform.

RESEARCH AND THE WEB

The condition, known as equine leukoencephalomalacia, was well documented. Each year, in fact, it claimed a few horses throughout the vast state of Texas. But this year was different. More than 100 horses, found in more than 60 clusters, had become ill and died. The cause, the authorities knew, was fumonisins—deadly toxins that were produced by a corn mold called *Fusarium moniliforme*, which grew on corn that had been harvested while wet or improperly stored. Fumonisins—long considered a minor hazard of raising livestock—were also known to kill pigs, and researchers suspected a link to several diseases in other animals. So Texas farmers were advised to test their corn-based feed for the presence of fumonisins and make sure it was stored in a dry place for no longer than two weeks. Beyond that, there was little they could do.

It was Texas in 1989, and all that was true. Less than a decade later, a few hundred miles to the north, in Des Moines, Iowa, researchers at the large agritech company Pioneer Hi-Bred International Inc. wondered if a new computer-driven discipline—called bioinformatics—could come up with a way to control the toxin. To pursue that research, they partnered with a New Haven, Conn.-based biotech company called CuraGen Corp., whose cutting-edge database-searching tools could scour millions of genetic sequences in a few seconds and possibly identify the genetic structures of proteins that appeared to inhibit the growth of the fumonisins.

The Pioneer Hi-Bred research team, led by Susan Martino-Catt, a research coordinator in the genomic division in Johnston, Iowa, had already identified a black yeast that seemed to contribute to the degradation of fumonisins. Martino-Catt's team extracted RNA from the yeast and sent samples to the CuraGen lab half a continent away. There, the RNA samples were run through a battery of genomic analyses, every one of which was controlled and studied by the scientists back in Iowa.

JUST A COUPLE OF YEARS AGO, THE FUMONISIN research could have easily taken two years in the lab. But last year, it took only 12 weeks to identify all of the genes in the enzymes that appear to break down the toxin. Much of that speed can be attributed to CuraGen's complex algorithmic genomics tools. And much of it can be attributed to the small biotech company's imaginative use of the Internet, which CuraGen uses to give research partners access to tools and databases.

In basic terms, CuraGen uses the Internet in the same way financial planners do: to deliver informa-



BUILDING AND DEPLOYING ENTERPRISE APPLICATIONS

BEST PRACTICES
LESSONS LEARNED



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PART ONE: STRATEGIC APPLICATION DEVELOPMENT FOR THE INTERNET AGE

Gaining Strategic Advantage

Despite all the talk about packaged commercial applications, despite the availability of off-the-shelf ERP, supply chain, customer relationship management, sales and marketing solutions, when organizations need to gain a strategic advantage from their information systems, they still need to build and deploy custom applications. And in a world moving at Web/Internet speed, those applications must be built with stunning swiftness and deployed enterprise-wide and beyond.

BUILDING AND DEPLOYING ENTERPRISE APPLICATIONS



ILLUSTRATION BY: DON BISHOP

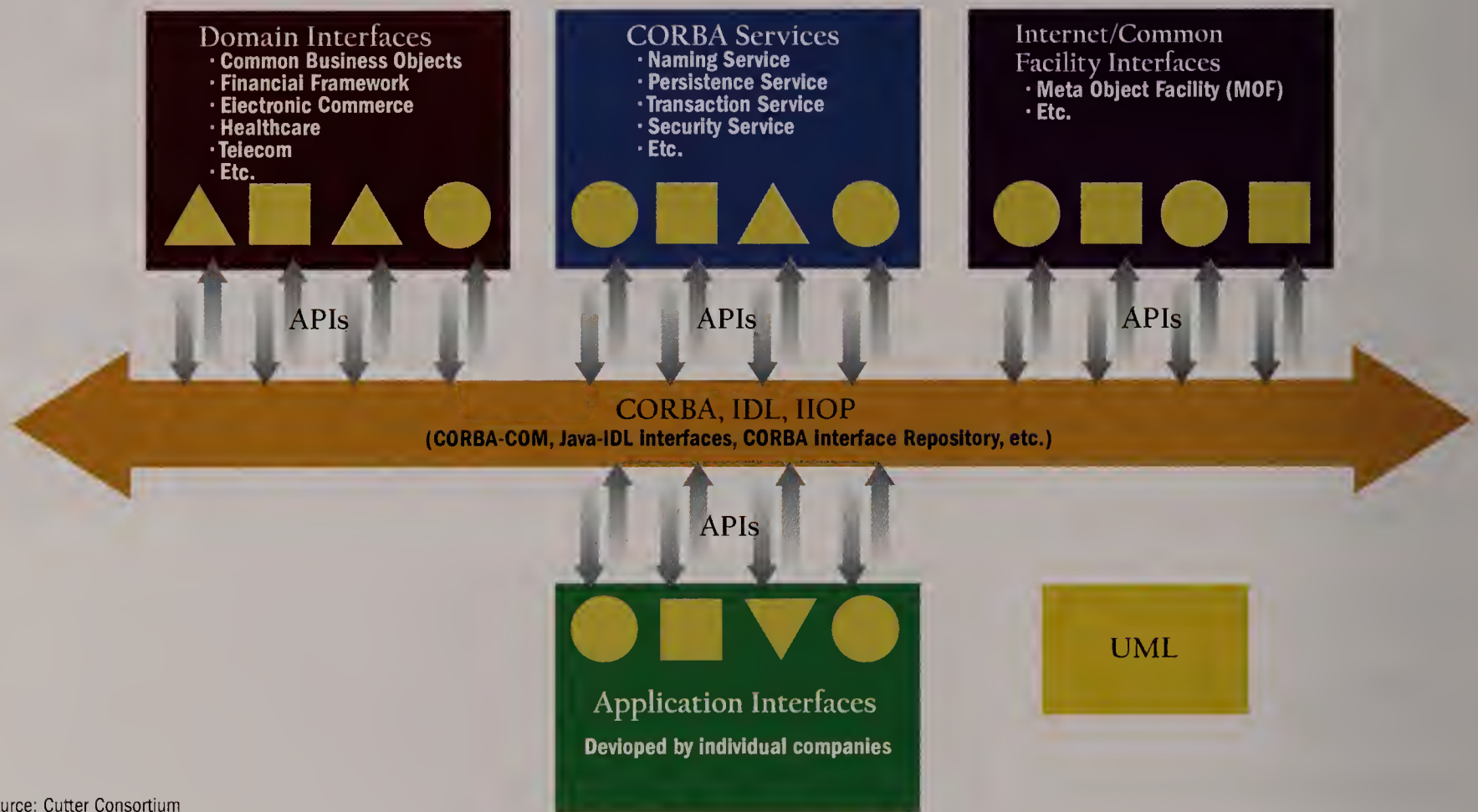
There have been great strides in commercial, off-the-shelf software in recent years. New functionality, higher levels of integration, improved user interfaces, rapid deployment toolkits, published application programming interfaces (APIs) for easier customization, vertical industry specialization and new software licensing models, including the rise of application service providers, all combine to make packaged software increasingly attractive.

And custom development practices in the past have done little to discourage organizations from seeking ready-made software solutions. The corporate application development process has suffered from long development cycles, taking years to deliver applications that are obsolete the day they go into production because the business has changed in the meantime. In the past, custom development has been characterized by big application backlogs, cost overruns and canceled and abandoned projects.

As recently as a few years ago, Gartner Group reported that more than 90 percent of major software projects came in over budget and behind schedule while 31 percent of the major projects got canceled before completion. And the quality of completed applications was suspect. It is no wonder organizations turned to packaged applications.

But packaged applications don't pro-

The OMG's Evolving Object Management Architecture



Source: Cutter Consortium

FIGURE 1

vide a complete answer. Packaged applications, too, can be very costly and slow to implement and, no matter how well designed and engineered, will bring the organization only to parity with the level of its industry. With all or most competitors in an industry running the same or similar packaged applications, no one gains a competitive advantage at that level. To capture what is unique about the organization and leverage that uniqueness for competitive advantage, organizations must, at the least, build some custom applications.

This supplement looks at the strategic implications of building and deploy-

ing custom strategic applications quickly as a critical competency of organizations that intend to thrive in the emerging Internet-driven business environment.

- Part One identifies where organizations are today and where they must go. It examines the global business environment and how it affects an organization's business processes and supporting applications. It explores the value of applications as a corporate asset to be leveraged going forward. It also identifies the obstacles that have prevented organizations from fully capitalizing on their applications. Finally, it intro-

duces a strategy for overcoming those obstacles based on standard, reusable distributed components and key enabling technologies.

- Part Two examines the open, standards-based enabling technologies that are allowing companies to regain control of their strategic application development and describes how those technologies address key strategic issues: productivity, time to market, investment protection, staffing and training and cost reduction.

Profiled throughout this supplement are companies that have worked with enabling technologies. Their experiences represent best practices that organizations can model as they develop and deploy custom applications to achieve competitive advantage.

Today's Corporate Computing Environment

Today's corporate computing environment, especially among large organizations, contributes to the difficulties

Packaged applications, too, can be very costly and will bring the organization only to parity with the level of its industry.

of building and deploying applications, both packaged solutions and custom-built applications. Gone are the days of single, centralized host systems, which processed the code and managed the data all in one place. The information systems in organizations today—multivendor and highly distributed—complicate application development and deployment. They force the IT organization to address a variety of problems:

- Multiple hardware and operating system platforms of varying vintages and extensive incompatibility
- Multiple desktop (client) systems, again with varying levels of incompatibility
- Multiple local and wide area networks, which introduce more incompatibilities

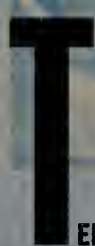
In this distributed world, messaging and communications become paramount. Pieces of the application logic spread across a variety of servers and hosts must communicate with each other via messaging to perform the work of the application. The need for programmers to set up and maintain such communications across the heterogeneous computing environment in particular has proven to be an enormous burden, slowing the development and deployment of applications.

The rise of the Internet also complicates the immediate application development and deployment challenge. It adds more platforms and layers of technology while dramatically raising the ante in terms of scalability, manageability and end-user ease of use. With the Internet, the IT organization suddenly finds itself building applications that may be used by tens of thousands of users, of unknown levels of computer and application literacy, running a vast array of unknown desktop systems.

At the same time, the Internet is driving organizations to introduce new products and services faster than ever. Applications that once took years to develop and deploy must be put into production in a few months, if not weeks.

CASE STUDY

OBJECT DESIGN, INC.



Tellabs—Implementing an Object Database to Speed the Component/Object Development Cycle

TELLABS, IN LISLE, ILL., is a leading supplier of data, voice and video transport and network access systems to providers of communications services worldwide. With more than 5,000 employees, the company hit \$1.6 billion in revenue in 1998 and is on a pace to reach \$2 billion by 2000.

Tellabs' Network Solutions Group creates management software, referred to as element management systems, to facilitate the administration of its products. In the past, these products featured difficult-to-use command line interfaces, which required administrators to memorize and input long text commands. The new management software, however, provides an easy-to-use, more intuitive graphical interface. "This is a much more efficient way to manage these products," explains Jeffrey Schmitz, director of Tellabs' Network Solutions Group.

Faced with the requirement for a complex graphical interface, complex equipment information models and the need for a high level of scalability, the application design team opted for an object-oriented approach. The team designed the management software as large collections of C++ object classes. The designers also determined that persistence (nonvolatile storage) was an important part of many of the objects the group would build and set out to find a robust, enterprise-ready object database management system appropriate to the task, reports Schmitz.

The company evaluated a number of object databases before settling on ObjectStore from Object Design Inc. ObjectStore increases productivity levels and shortens time-to-market by drastically reducing the amount of complex code required to develop today's demanding business applications. ObjectStore Enterprise Edition provides a distributed multitiered architecture that leverages replication and caching of both data and services to meet scalability demands.

With the help of ObjectStore, the Tellabs developers are able to build a complete release of the software in less than half the time it took before. Explains Schmitz: "The object database makes the design much more straightforward. We don't have to map to a relational database schema which eliminates a step." With each step it eliminates from the development process, Tellabs speeds development of its management software.

Modifications and enhancements that previously took weeks must now be made in days or even hours. And the Internet raises the bar in terms of reliability and scalability. When customers are only a mouse click away from a competitor's Web site, they have little patience for applications that crash or perform poorly.

The Importance of Corporate Applications

The Internet also has shone the spotlight on the importance of corporate

applications. Astute top executives as well as IT professionals have long recognized the organization's applications as valuable assets. These chunks of software code, usually invisible to most people in the organization, capture the business process knowledge and expertise of the organization. They process transactions, drive production, manage workflow, facilitate collaboration, expedite decision making, speed customer service and support all aspects of the organization.

Management journals and business school cases are filled with accounts of costly disasters resulting from the failure of the IT organization to deliver reliable application functionality on time. From airports to banks to the telecommunications industry, the failure of IT to deliver reliable functionality on time has resulted in multimillion dollar losses, plunges in market share and missed windows of opportunity. Most recently, application failures at highly capitalized Internet dot-com companies have resulted in immediate and precipitous market devaluations.

The Internet both dramatically increases the pressure on companies to bring out new application functionality fast and underscores the critical importance of the applications to the very success of the business. From Amazon.com to Dell Computer to

The failure of IT to deliver reliable functionality on time has resulted in multimillion dollar losses, plunges in market share and missed windows of opportunity.

Cisco Systems to Charles Schwab, it is their sets of applications that enable these companies to grab millions of dollars in new business. Well-recognized competitors that have fumbled in developing and deploying comparable Web-based application functionality as quickly, including some of the most blue chip of companies, find themselves in a desperate game of catch-up, with success far from assured.

The Application Development/Deployment Challenge

For most companies, "the issue has long been how to build and deploy systems faster and cheaper and more reliably," observes Andrew Watson, OMG vice president and technical director. The Internet simply highlights what organizations have long recognized: Application development and deployment is a critical competency if they

CASE STUDY

GEMSTONE SYSTEMS, INC.

BEST
PRACTICES

Campus Pipeline Building an Online University Portal

CAMPUS PIPELINE, IN SALT LAKE CITY, supplies Internet portal applications for students and faculty in a university setting. The application integrates existing campus software with a browser interface customized for each individual. Campus Pipeline software enables colleges and universities to serve as exclusive providers of personalized electronic communication for their entire on- and off-campus populations.

The objective of Campus Pipeline is to help colleges and universities unite their entire campus community by publishing student and professor information, class schedules, workgroups, discussion groups, class syllabi, e-mail, on-campus event listings and club activities in an electronic and easily accessible format. The result is an online university portal, where all these facets of university life are tied into a single location.

To deliver on this vision, Campus Pipeline teamed with Systems and Computer Technology Corp. (SCT) and GemStone Systems Inc. to supply applications and application server infrastructure. Campus Pipeline chose to use GemStone/J, a secure, scalable Java application server with built-in support for Enterprise JavaBeans, CORBA and Web integration. GemStone/J architecture supports hundreds of distributed Java Virtual Machines (JVMs) to run all the services and

a CORBA infrastructure that provides support for distributed communications. GemStone/J's Object Transaction Monitor (OTM) supports XA-compliant, scalable and load-balanced distributed transaction services so that users can carry out tasks on the system that may touch several data sources. A large persistence mechanism in GemStone/J is used to store Java objects that represent business entities such as users, their e-mail and preferences.

For all members of the university community to have access to the system, GemStone/J provides a Web server integration strategy and Java servlet engine that can support a user community of 70,000 or more. The Campus Pipeline portal application also integrates with SCT's Banner2000 enterprise application, which also runs on the GemStone/J platform and includes a business process design tool that teams business processes, best practices, people and information.

The result? "By leveraging GemStone's application server technology, Campus Pipeline is more efficient in providing personalized content, tracking user preferences and integrating with core university systems, thereby significantly reducing the time to market for our solution," says William Borghetti, co-CEO, Technology, Campus Pipeline.

Our Guts. Your Glory.



"(GemStone) didn't have the fluffy tools. But they have the most scalable core services—load balancing, persistent cache architecture."

—Tony Curwen, VP of core technology, Ingram Micro in CNET News.com, June 17, 1999

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are to remain competitive. It is also very difficult to do effectively.

Complicating the effort is the existing corporate computing environment, noted above. "Organizations have to learn how to cope with the fact that they already have systems in place," Watson notes. These systems contain much of the knowledge and business process expertise of the organization. They cannot be easily scrapped or otherwise abandoned. There is a valuable investment here that should be protected and leveraged.

The solution, Watson continues, is to reuse much of what is already there. Research, in fact, shows that 70 percent of application development investment lies in the creation and recreation of the integration infrastructure. For organizations that have already invested immeasurable effort

For organizations that have already invested immeasurable effort and millions of dollars in existing systems, reuse is critical to building and deploying new applications quickly.

and millions of dollars in existing systems, reuse is critical to building and deploying new applications quickly. By reusing existing code, organizations can leverage the investment they have already made while reducing the amount of time and effort required to deliver new applications.

Then there is the newest wrinkle: the extended enterprise. "Now you have to figure out how you are going to connect

with your partners and customers and their systems," Watson points out. Until recently, organizations didn't bother connecting their systems to those of their partners and customers. But with ubiquitous Internet access, effective organizations want to exchange information electronically with partners and customers and access each other's applications, which can streamline the business process and reduce costs.

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Effective Application Development in the Internet Age

Companies will not succeed in the Internet age if they cannot build and deploy applications quickly, if they cannot leverage their existing investment in applications and systems, or if they cannot quickly integrate with their own and their partners' and customers' diverse information systems. Established companies also need to respond to the upstart dot-com companies, which appear overnight, command astounding market capitalization and quickly redefine established business processes as they seize market share.

While the Internet may be the most recent catalyst, this need for faster and easier application development and deployment is not a new phenomenon. "In the last 10 to 15 years, we have seen

the bar raised in terms of what you have to build by way of applications if you want to compete," notes Jeff Mischinsky, senior software architect, Inprise Corp. No longer is it acceptable to build isolated stovepipe applications. Neither can organizations afford to build rigid applications that require an army of programmers every time something changes.

Instead, organizations have had to build applications that communicate with other applications, that integrate seamlessly on both the data and process level, which allow customers and partners to get at information and interact with business processes. The advent of the Internet simply accelerates this effort.

Until recently, building the kind of applications organizations require to be successful in the Internet environment was a slow, costly, error-prone process,

and the results were inconsistent at best. The effort, bordering on the proverbial rocket science, required people with costly, hard-to-find skills. Some companies adopted cumbersome, complex methodologies. Other companies invested heavily in expensive proprietary tools that failed to deliver.

Today a new generation of open, standards-based components, enabling technologies, and a development strategy centered on the assembly of pre-built and/or custom-made reusable components is revolutionizing the way organizations build and deploy distributed, enterprise applications. This new approach is enabling rank-and-file programmers and technically savvy business people to assemble, modify and deploy business-critical applications faster than ever. The new approach masks the underlying com-

CASE STUDY

EC CUBED, INC.

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PRACTICES

TPN Register—Leveraging Best-of-Breed Reusable Components for Fast Development

TPN REGISTER, IN ROCKVILLE, MD., hosts a global electronic marketplace for buyers and sellers of indirect and Maintenance, Repair and Operations (MRO) products and services. Using the state-of-the-art contract and catalog management platform developed for the marketplace by TPN, participating buyers can quickly and cost-effectively locate the products they need, while suppliers can increase sales and reduce order rework.

In building the underlying applications, the company wrestled with how best to deliver and enhance its unique functionality. Initially, the company built from scratch, which gave it great control but slowed the development process and increased the cost. In the next iteration of applications, the company turned to third-party e-commerce solutions. This proved faster but lacked much of the functionality TPN needed to provide.

Finally, the company decided to pursue a hybrid strategy, combining its own development efforts with third-party software components. "We chose to use best-of-breed components, which would let us maintain a high level of functionality and achieve speed," explains President Ray Schiavone.

To make this strategy work, the company specified open, standards-based components and interfaces, such as CORBA, EJB,

ODBC and JDBC, as part of its component-based architecture. Reusable components, the company realized, were key to achieving the speed and flexibility required.

For best-of-breed components, the company turned to EC Cubed. Its ecWorks suite of e-commerce components provides the application architecture that allows for rapid application development, enterprisewide consistency of business rules and quick response to changing business requirements. Each is a self-contained software module with clearly defined, open interfaces that offer high-level business services. They provide such functions as user authentication/authorization, user notification of business events, process definition and routing, business partner mediation and collaboration, and data integration.

TPN's payoff in its use of ecWorks came quickly. The company was immediately able to double the number of release cycles for its platform applications, reports Gary Hare, vice president of products. The bottom line: Due to reuse of ecWorks components, the company is delivering applications 50 percent faster and with added functionality. As an added benefit, since ecWorks is optimized for today's distributed computing environment, TPN can support its customers with 30 percent less hardware.

KAREN BOUCHER specializes in component/object technology and middleware technology (transaction processing monitors, enterprise messaging technology and object request brokers). Boucher has over 10 years at The Standish Group, in Dennis, MA. Her latest book, *The Essential Guide to Object Monitors*, is published by John Wiley & Sons, Inc.

CIO: There has been a lot of hype surrounding component-based development (CBD). Is there any substance behind all the hype?

KB: There is much more than just the hype. Companies can achieve real benefits using CBD. We did a study last year and turned up 60 companies that were getting real payback, real return on investment out of CBD and object-based development based on the number of applications they produced each year.

CIO: CBD arose alongside client/server development. Has the Web and the Internet made CBD obsolete?

KB: CBD is not just an approach from the past. It works with the Web. CORBA and EJB component standards are really about services and reusing services. And CBD technology is still evolving with the Web. For example, CORBA and EJB are becoming more closely aligned.

CIO: Can any company take advantage of CBD or is this something only for companies that are willing to live on the bleeding edge?

KB: Conceptually, any company can benefit from CBD. But there is some learning involved. They need to develop CBD, CORBA and EJB skills. Also, the organizations that will see the most benefit from CBD are larger ones that put out a large number of applications and can profit from reusable components. For small companies, CBD might be overkill.

CIO: There seem to be religious wars between the various component models: COM, CORBA and EJB. Do organizations have to commit to a single standard to benefit from CBD?

KB: Companies can mix and match components built to different standards using bridge technologies, but it is easier to standardize on one object model. As I noted before, CORBA and EJB are becoming much more closely aligned. COM still presents problems. You can have different parts of the company using COM and CORBA and make them work together, but there will be a lot of sweat and heartache involved.

CIO: All the vendors tout openness and support for open component standards. Can organizations make a bad choice and find themselves stranded out on a limb?

KB: All the products are aiming to achieve the same general goal, but yes, you can make a mistake. It is not easy to switch between component models. And even within a given component model, you may not find that everything works with everything else. Some products include proprietary pieces. That's not to say things will not get easier; there are ongoing initiatives to make the component models work better together, such as the OMG's component model standardization efforts.

CIO: So what are the investments and risks of CBD, and how can managers minimize the risks?

KB: Three years ago, there was a lot more risk in every aspect

of CBD than there is now. Today, so many products and vendors support CORBA and EJB that the risks have been greatly reduced. Five years from now, components will be so widespread that there will be transition strategies and tools. The truth is that despite the risk, companies have no choice about components any more. Every new product they buy is probably component-based. The size of the investment in CBD is still an issue, but managers can control that. The size of the investment depends on the skills of the staff and the organization of development teams and the development process.

CIO: The industry is also witnessing the growth of packaged core business applications like SAP and PeopleSoft. Do these change the way organizations think about CBD?

KB: Most of the ERP and packaged application vendors support components to some degree, but you can't just bring in their components, modify them or reuse them. They are still pretty much outside COM and CORBA, although the packaged application vendors offer some support for the industry standards. Another group of



KAREN BOUCHER

new, smaller vendors are offering component/object frameworks that, in effect, deliver packaged applications. These do support CORBA and EJB and allow for much more flexibility.

CIO: Enterprise application integration is emerging as the latest IT battle cry. Do components and CBD do anything to address the application integration challenge?

KB: At this point, CBD is probably more on the sidelines for this issue but on its way to moving closer to center

stage. Enterprise application integration is about making existing applications and legacy and packaged applications talk to each other. CBD, CORBA and EJB on the other hand are much more focused on new applications. But both CBD and enterprise application rely on standard messaging, so this should make integration of all applications easier going forward. There are ongoing initiatives which aim at bringing standard communication means (like CORBA) to messaging and EAI products. The big hope is that all these efforts will morph into a standard interface, but it hasn't happened yet. The end result of this focus on standards for EAI products will help companies ease the integration burden with less fear of being locked into specific vendor implementations, so it is a work in progress. But the marriage of the two is one that can provide great benefit to users.

CIO: Component reuse is often held up as the holy grail of CBD, the key to achieving its biggest benefits and payback, but it seems to be very costly and takes a considerable amount of time and effort. Is the effort to achieve component reuse really worth it?

KB: When an organization gets there, it is worth it. The question really is how much reuse and when you get it. Many companies achieve 10 percent reuse. After spending a lot of money and time upfront on analysis and design, it might not be worth it at first. But if you can figure out how to consistently achieve reuse and get more component reuse with each new application, you can experience huge gains.

CIO: So how does an organization get the big reuse payback?

KB: In our research, companies that have gotten the highest reuse have done a few important things. One, they use formal design and analysis tools. Two, they use standard middleware and ORBs to provide reusable services for all the applications. Three, they use an object framework, which is basically a template. The framework can be one they've bought or built. Companies that do these three things can achieve 80 percent reuse and put out new applications in a matter of a few weeks. In addition, the company can help speed reuse by using a component/object librarian, a component architect or a group to track component usage and foster reuse.

CIO: When can managers expect CBD to be ready for prime time IT usage?

KB: It has been a slow ride, but it is happening right now. There are tools that support CORBA and EJB transparently. There are tools that have you creating CORBA code without even knowing it, and there are middleware products supporting CBD.

Q&A

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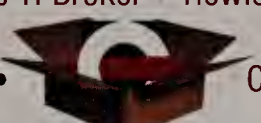
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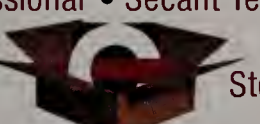
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plexity, allowing people to conceive, design, build, assemble, deploy and subsequently modify applications in business terms.

PART TWO: ENABLING TECHNOLOGIES FOR RAPID DISTRIBUTED APPLICATION DEVELOPMENT AND DEPLOYMENT

The solution to the problem of building and deploying applications quickly is to adopt a component-based assembly development process much like that used in conventional manufacturing. For example, an auto maker designs and builds new cars primarily from proven components. While a new car may incorporate some newly created technology, the new pieces typically represent a small percentage of the total vehicle. The bulk of the vehicle consists of existing components. And the latest new pieces will become part of the inventory of reusable components in subsequent products.

The solution to the problem of building and deploying applications quickly is to adopt a component-based assembly development process much like that used in conventional manufacturing.

Component-based Application Development

The software equivalent to manufacturing assembly is component-based development (CBD). Components are discrete pieces of software code that perform a recognizable function. Low-level components typically perform some highly specialized or technical function. High-level components perform identifiable business functions, such as accessing a database or processing a transaction or checking a customer's credit balance.

Components are self-contained. To use components, a developer need only know what the component does and how to ask it to perform its task. What happens inside the component is invisible to the application and irrelevant for the purposes of application development. A component usually offers ways for developers to modify or configure its behavior. If necessary, a component can be further extended or modified by the developer, producing a new component.

Components perform the work of

CASE STUDY INPRISE CORP.

BEST PRACTICES

First Union Bank—Adopting a Common Component Framework for Flexibility and Speed

FIRST UNION BANK, IN CHARLOTTE, N.C., is the sixth largest bank holding company in the United States, with \$234.6 billion in assets. The bank serves more than 16 million clients.

As a leader in the rapidly changing banking industry, First Union felt pressure to introduce strategic business applications quickly as well as to reduce application development costs. Reusable business objects and distributed common components held the key to achieving fast development and lower costs, but individual business groups resisted previous efforts because they restricted their choice of development languages and tools. A more flexible approach to components was required.

The solution was a standards-based component framework. "A common framework would let us use whatever language our partners needed to use in development," explains Bill Barnett, manager/distributed application technologies. For that framework, the bank chose CORBA because of its platform and language independence. The use of the CORBA framework would allow the bank to extend and combine components in different configurations to meet the requirements of different lines of business.

As an integral part of the CORBA framework, First Union select-

ed VisiBroker for Java and C++ from Inprise as its object request broker, which further allowed the bank to keep its options open. In addition, VisiBroker's thread pooling and implementation of the CORBA Naming Service offered the kind of scalability the bank required to handle its large and growing transaction volumes.

The bank used VisiBroker for Java and C++ as the underlying infrastructure for its new Customer Central and Document Central internal business applications. VisiBroker provides the connectivity that enables employees using both critical customer service applications to transparently perform transactions involving the coordination of several independent legacy systems distributed across the network. VisiBroker's CORBA naming service makes it easy to add more servers or substitute larger servers to handle growing volumes.

The strategy has paid off. Using the new component model, Barnett reports, the bank was able to incrementally extend Customer Central and Document Central application components to meet the needs of different divisions. Furthermore, developers report that they could not have delivered the required functionality on time without the reusable components.

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the application by communicating among each other to complete a function, such as processing an order. For example, a developer can assemble a customer management component, transaction component, database access component and other components to create a new application with minimal writing of new code. In this way, CBD speeds development and reduces costs through increased developer productivity. It also delivers consistent, high-quality applications through the use of proven, tested components.

CBD results in flexible applications. When something in the business environment requires that the application be changed, only the affected components need be modified or replaced. "You glue together components to meet today's need. When the business changes tomorrow, you just rearrange the components," notes Watson.

When something in the business environment requires that the application be changed, only the affected components need be modified or replaced.

And components are reusable. Organizations can collect libraries of proven useful components for use in subsequent applications. For example, a security management component can be reused in every application that requires security, eliminating the time it would take developers to build a security function each time and ensuring a consistent approach to security across all the organization's applications. The library of reusable components itself can become a valuable corporate asset.

CBD Enabling Technologies

CBD requires the support of several key enabling technologies to deliver its strategic payoff: speeding development and lowering costs. The foremost requirement is an open standard that provides a consistent way for components to communicate with each other and for developers and applications to access and trigger component functionality.

In addition, CBD benefits from middleware and frameworks that provide the routine, low-level technical services

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required by almost any application. In the past, corporate application development groups have burned untold resources and time creating and re-creating this underlying complicated plumbing or infrastructure for every application.

With the advent of component/object models such as OMG's CORBA component model as well as Enterprise Java Beans (EJB), a complementary Java technology, application developers have the open, standards-based communications, middleware and framework to effectively pursue CBD. "CORBA is a mechanism to tie together all the pieces and make CBD easily accessible to any programmer," explains Watson.

Using enabling technologies such as CORBA, programmers and business analysts will ultimately be able to work at higher levels of abstraction to create business programs by assembling business components. When the business changes, they will be able to quickly reconfigure and reassemble the application to respond to the change. Underneath it all, Watson continues, CORBA will transparently tie together all the low-level technology pieces—the back-end databases, the application logic and the front-user pieces.

Unified modeling language (UML) is another enabling technology for CBD. UML has emerged as a public standard for visually creating models of component-based applications. UML enables developers to define the components of an application at yet an even higher level of abstraction, which makes application development that much easier. At the end of the process, software tools can automatically generate large parts of the application, explains Richard Soley, OMG CEO. When the application needs subsequent modifications or enhancements, these can be made in the model and quickly regenerated.

Web-Enabling Technologies

CBD and its enabling technologies alone won't solve today's application

CASE STUDY
2AB, INC.



Express Scripts—Laying the Foundation for a Component-Based Architecture

EXPRESS SCRIPTS INC., IN ST. LOUIS, is the largest independent pharmacy benefit management firm in the United States. It handles claims adjusting, claims eligibility, drug utilization review and a variety of other services for its clients, which include HMOs, insurance companies and third-party administrators as well as large commercial organizations. The company, with 4,200 employees, manages coverage for 47 million people. In addition to pharmacy benefit management, the company provides prescription drugs through five mail-order facilities.

The very nature of Express Scripts business requires extensive integration with its customers systems. "We do a lot of system-to-system communication. Paper is not desirable here," explains Dale Chamberlain, vice president and chief technology officer. Such integration required extensive use of middleware. To achieve integration, the company quickly found itself in the middleware business, using low-level technologies such as sockets. Between the need to integrate acquisitions and the need to connect with the systems of its partners and customers, Express Scripts found itself increasingly mired in building and maintaining middleware.

"What we needed, ideally, was a standard open interface that would work with all the different platforms," Chamberlain recalls. The company found what it needed in CORBA, an open standard that worked across multiple platforms. CORBA immediately reduced the need for Chamberlain's own staff to build and maintain middleware.

To help its staff manage the transition to CORBA, Express Scripts turned to 2AB Inc., in Pelham, Ala., which provided transition management services, mentoring to software development teams, architecture workshops, enterprise architecture training and customer software development.

Express Scripts has established CORBA as its integration platform and future strategic direction. By building CORBA interfaces in Java, the company quickly launched its own Internet pharmacy, www.yourpharmacy.com, and integrated it with its existing back-end pharmacy systems. Declares Chamberlain: "With the help of 2AB, we have begun to develop and leverage a growing set of CORBA components and define a CBD methodology. We are definitely out of the middleware business. And each time we reuse CORBA components, we save money."

development challenges. The Web has emerged as a major factor. The Web can be viewed at the ultimate network, connecting businesses, individuals, applications and information on a vast scale.

In many ways, the Web simplifies application deployment and eliminates many of the problems that plagued application deployment in the past. By standardizing on the browser client, a front-end presentation language

(HTML) and a communications protocol (HTTP), the Web allows a single user interface to access millions of applications, which, Soley observes, has tremendous strategic business implications.

The Web makes it possible for customers, prospects and suppliers to access an organization's information and applications. This opens up a host of possibilities for growing the business and streamlining business processes.

Key Web-enabling technologies include Java, EJB, application servers and XML.

- Java is a component/object-oriented, platform-independent programming language that works particularly well with the Internet and is often used to create either CORBA or EJB components.
- The EJB standard, closely aligned with CORBA, enables component-based development of distributed applications and deployment via the Web.
- Application servers represent a new form of middleware, which uses CORBA and EJB technology to connect Web clients to appropriate applications and services, wherever they may reside.
- XML extends the capabilities of HTML beyond static display, enabling application developers to effectively use the Web client as a universal, interactive application front end. XMI (XML Metadata Interchange) uses XML (Extensible Markup Language) to enable component repositories and object-oriented application development tools to interoperate and communicate.

Organizations can combine CBD and CBD-enabling technologies with the Web and Web-enabling technologies to address many of the application development and deployment problems that have hindered organizations in the past while producing dramatic results in the following key areas:

- **Interoperability among Heterogeneous Systems**

Incompatible systems can frustrate organizations at every turn. However, by treating existing systems as components unto themselves and using CORBA, organizations can achieve widespread interoperability. The trick, suggests Soley, is to define standard, easily maintained interfaces, specifically CORBA interfaces, and let automated tools underneath handle the detailed mappings, translations and transformations required.

Similarly, CORBA can be used as the

Ladder of Application Development Abstraction



FIGURE 2

foundation for a wide range of enterprise application integration (EAI) efforts.

A number of EAI vendors incorporate CORBA into their own tools. The use of CORBA ensures a more open solution, eliminating the need to build or buy proprietary EAI tools that may be difficult to maintain over the long run. Gartner Group predicts that object/com-

ponent technology, which underlies EAI, will provide the foundation for 98 percent of new applications by 2001.

- **Extending the Enterprise via the Web**

Successful organizations today extend beyond their own four walls to embrace suppliers, partners and customers. The Internet plays a critical role, allowing suppliers, partners and customers to access not only information but applications. Suppliers can follow inventory levels to ensure sufficient supplies just in time. Partners can coordinate workflow via the Web. Customers can perform many service functions, from address changes to order-status updates, on a self-service basis, resulting in greater customer convenience and lower cost.

Just as components facilitate integration within the organization, so too can CORBA and EJB components speed the development and deployment of Web applications and interoperability among the systems of customers, partners, suppliers and the organization. Again, CORBA's ability to provide a consistent, standards-based platform- and language-neutral interface to diverse applications and systems while automating the underlying communications ensures that organizations can quickly project their reach over the Internet.

- **Increased Productivity and Faster Time-to-Market**

The coding-intensive nature of application development has long prevented organizations from speeding develop-

Organizations can combine CBD and CBD-enabling technologies with the Web and Web-enabling technologies to address many application development and deployment problems.

CASE STUDY

STERLING SOFTWARE

BEST PRACTICES

Universal Underwriters—Paving the Way for Component Reuse

UNIVERSAL UNDERWRITERS, IN OVERLAND PARK, KAN., a division of the global Zurich Financial Group, specializes in property and casualty insurance for auto dealers. The company had long used a proprietary system that was very advanced in its day but was clearly showing its age. The company decided to build a new system using standardized components with the long-term goal of leveraging those components across a number of projects.

"We knew that it would cost us 25 percent more to build the system initially using component-based development, but we expected to harvest about 30 reusable components from the effort and get a fast payback," explains R.G. Eaton, head of the company's solutions support center. The extra cost comes from the additional upfront work required to plan and design components suitable for subsequent reuse. But the company intended from the outset to reuse the entire application for other specialty business lines.

Using Sterling Software's COOL:Gen development tool, the development team began work on the application with the help of Castek, an application development consulting firm in Toronto. "We've been using Sterling Software's COOL products for five

years and also participate in the CBD Customer Advisory Board, where companies from around the world share best practices. The application itself consists of 30 very large business-level CORBA components in addition to a number of lower-level infrastructure components," says Eaton.

The application was finalized over three development generations, with the components becoming generally more reusable with each iteration. "It was intended to be reusable from the start, but it would take too long if we tried to get it all at once," notes Eaton. Instead, the iterative approach gave the company a functional interim application while it honed the components for reuse. Castek, which took on the bulk of the actual development, also handled the design and scoping of the components.

The system, which has been undergoing tests, goes fully live this fall. But already Universal Underwriters has started harvesting some components for reuse. "We've established a reuse center," Eaton reports, and with the help of Castek, the company is formulating reuse practices. The reuse center itself adds overhead to the component process, but compared to the value of reuse, the extra overhead is insignificant. Already, Zurich Financial is planning worldwide reuse for some components.

ment, boosting developer productivity and reducing costs. Each application, for the most part, is handcrafted, with developers coding both the unique business logic as well as the routine supporting infrastructure.

Standard components enable organizations to design and build applications in terms of reusable blocks of code, the components. Using existing components, either previously built by the organization or purchased from a third party, the organization can eliminate large amounts of coding, particularly for routine functions and supporting infrastructure, which boosts developer productivity and speeds time-to-market. Pieces of legacy code or even entire legacy applications can be packaged as standard CORBA components and reused just as any other component.

In the same way, CORBA eliminates the need for developers to code the

underlying communications and support infrastructure services. And, through the use of UML, developers can work at increasingly higher levels of abstraction where they can create business applications in business terms.

Achieving the full benefits of reuse entails more than simply adopting CBD and CORBA. It requires changes in the application development process and the culture within the organization. It also takes time to achieve the benefits from reuse, but when organizations have acquired a sufficient supply of quality, reusable components, the results, in terms of cost savings, speed of development, flexibility and application quality, can be dramatic.

● Protecting Investments in Systems and Applications

Just as the use of standard components can integrate otherwise incompatible

systems, so too can component use ensure that organizations continue to receive value from applications and systems already deployed. When valuable legacy applications and functionality are packaged as components behind standard interfaces, they can be easily used and reused in new generations of applications.

And when those components are based on standards such as CORBA, the investment is protected long into the future. As a standard supported by the majority of vendors and platforms, "CORBA will evolve as necessary, without major changes, just as it did with Java," explains Soley. Between the binary portability provided by Java and the source portability provided by CORBA, which ensures that developers can build component-based applications in any language and deploy them on any platform, an organiza-

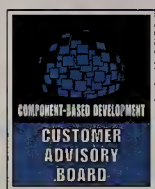


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RESEARCH AND THE WEB

tion—in the form of bioinformatic databases—and tools to help clients wring meaning out of that information. But the databases that CuraGen offers, and the tools that it leases, are many thousands of times more complex than those found on most financial Web sites. And while CuraGen's tools, like those on financial sites, are intended to make many people very rich, they have a higher purpose as well. CuraGen is in the business of mining genomic data to make drugs that treat and prevent diseases such as cancer.

CuraGen's genomic quest is not unique. For the past decade, thousands of researchers at hundreds of institutes, universities and commercial businesses have been racing to identify and characterize the genomes of many organisms, including the 80,000 to 100,000 human genes. The product of that effort is several genomics databases, some of which are available to researchers at no cost, and some of which are proprietary—sold to researchers for cash or a percentage of royalties from any drugs that may result from the research. CuraGen's database is a combination of the two: The company sells its database to pharmaceutical companies hoping to shave a few tens of millions of dollars off the current \$300 million to \$500 million cost of developing a new drug, and it gives away the database to academic researchers whose credentials are sufficiently impressive. In all, genomics researchers believe, they have identified meaningful sequences for as much as 95 percent of the human genome. Scientists at CuraGen have also identified more than 60,000 previously unknown SNPs, or single nucleotide polymorphisms—genetic mistakes, if you will—and the potential causes of disease.

Founded six years ago by a 36-year-old scientist named Jonathan M. Rothberg, CuraGen now employs more than 300 people. It is one of many companies that hopes to develop drugs based on an algorithmic vetting of genetic sequences and one of several young companies that essentially rents bioinformatic tools to large pharmaceutical companies. CuraGen's business plan calls for three streams of revenue: one from discovering and developing its own drugs, one from leasing its tools and databases to partner drug developers,



Research Assistance: Web technology freed CEO Jonathan Rothberg's staff to concentrate on developing genomic rather than software tools.

and one from royalties from drugs developed by partners.

Although the company's technology perches on biotech's bleeding edge, CuraGen has signed multimillion-dollar deals with major pharmaceutical companies ("big pharmas" in biotech speak) such as Biogen Inc., E.I. du Pont de Nemours and Co., Genentech Inc., Glaxo Wellcome Inc. and F. Hoffman-La Roche Ltd. There is good reason why.

"Developing a drug can cost a million dollars a day," says Jon Soderstrom, director of cooperative research at Yale University. "If you can knock just one day off, you save a million dollars."

Soderstrom says that there are several companies selling their databases, and there will no doubt be more—all of them banking on the need of the "big pharmas" to know all there is to know. "Each one of the databases gives scientists a different view on how to plumb the [genetic] depths," says Soderstrom. "And anything that can take time out of

the development process is worth the cost to their companies."

And while that cost is significant—the Glaxo Wellcome deal was worth \$48 million—it is less than it would be without Web technology. When CuraGen researchers collaborate with those at Glaxo Wellcome, for example, their colleagues are located in Research Triangle Park, N.C., in Verona, Italy, and in the United Kingdom. When they work with F. Hoffman-La Roche, their colleagues are in Palo Alto, Calif., in Nutley, N.J., in Basel, Switzerland, and in Heidelberg, Germany. When they work with Genentech, their partners are in San Francisco, and when they work with Biogen, their fellow researchers are in Cambridge, Mass. Yet, except for occasional visits from a few CuraGen staffers, most of the research staff never has to leave New Haven.

"We coordinate everything through the Internet and through phone conferences," says Martin Leach, CuraGen's



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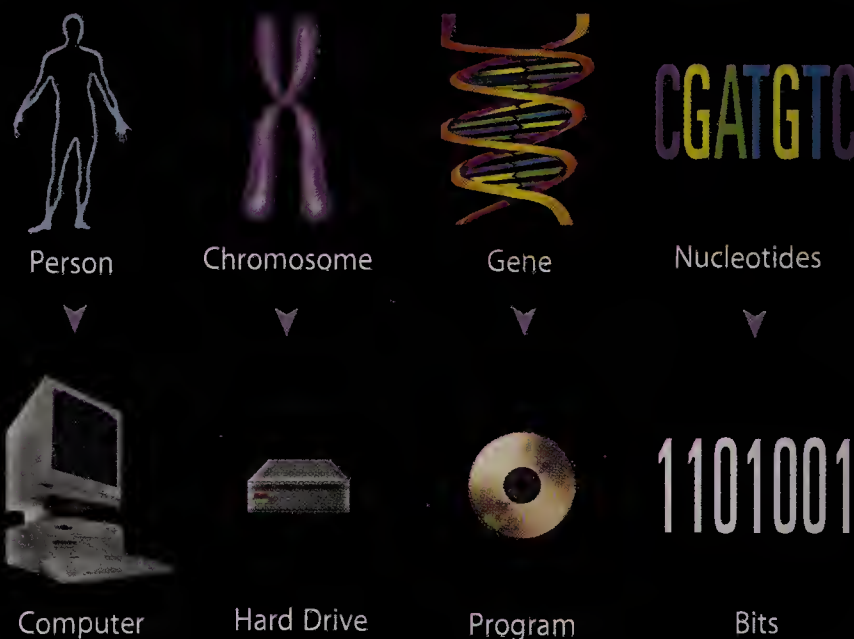


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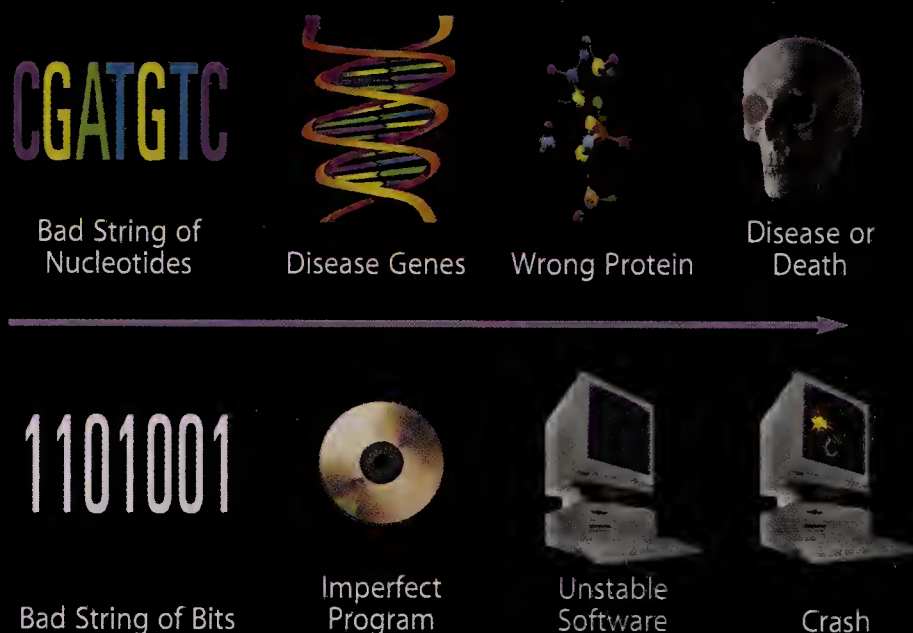
men versus machine

The Code in Your Body Is Like the Code in Your Computer...

Genetic researchers like CuraGen are combining biology with IT to rapidly uncover the sequences of genetic code to better understand the causes of complex genetic diseases. Eventually, they hope to apply this knowledge to the development of gene-based therapies that can prevent and cure complex, life-threatening illness.



...But Bad Code Can Make People Sick and Computers Crash



DNA is the genetic code or language that instructs proteins to build an organism and all its functions. Similar to binary code, which uses two characters (1s and 0s), genetic code uses four characters (A-adenine, T-thymine, G-guanine and C-cytosine) that, when combined in certain orders, influence an organism's development. Errors in code, known as polymorphisms or SNPs, can be responsible for causing diseases. Similar to a computer virus, errors in "programming" are believed to cause diseases such as multiple sclerosis, diabetes, Alzheimer's and others.

acting director of bioinformatics. "But, while the Internet is very useful, it can do only 80 percent or 90 percent of what we have to do. So we get together with partners every three or four months."

THE WEB-BASED ACCESS IS CONVENIENT and inexpensive. Still, some partners worry that their password-protected work areas are vulnerable to snooping competitors. In such cases, says Leach, CuraGen offers the greater security of a dedicated line. Leach himself, however, believes that the SSL encryption used by CuraGen is perfectly sound. It is, he points out, the same encryption method widely used to transmit credit card information.

Leach is a kind of professional hybrid, one part biologist, one part IT geek. As early as 1993, before the emergence of browsers, he would join dozens of other researchers logging in from all over the world in online discussions of the implications of certain gene sequences. "We would hold international meetings," says Leach, then a student at the Boston University School of Medicine. "We would take scientific papers, turn them into ASCII and have an online conference." In 1996 Leach was hired by CuraGen to act as a liaison between the biologists and the software designers. When he arrived, he was both thrilled and dismayed.

"I looked around the laboratory," he says. "I saw what the technology could do and thought, 'Damn, I could have done my thesis in three weeks.' As a biologist, it was demoralizing. It's possible that research that would have taken 10 or 15 years could be generated here in six weeks."

Working with Director of Bioinformatics James Knight and others on the bioinformatics team, Leach built an informatics infrastructure that advanced the development of CuraGen's high-throughput genomics workflow process. "What it does," says Leach, "is allow us to take a lump of tissue and run the output through thousands and thousands of gene sequences, some new, some that we've seen before."

In addition to building the tools themselves, Leach and Knight were charged with figuring out how to deliver those tools to researchers not just at CuraGen, but at other companies that might find

them useful. Back in those prebrowser days, the challenge was not inconsiderable, and the CuraGen team set out to build applications for tracking and processing data that would run on both PCs and Macs.

"When we first started the process, we were terrified," says CEO Jonathan Rothberg. "We were thinking about how we were going to support the different heterogeneous environments. We thought we'd need 40 people just to work on that alone," he admits. "We also thought we would have to have special leased lines to call in. Then the Internet came along, and it was perfect timing," he says. "Our first collaborations began in '96, and the tools were newly available. We installed Oracle, put the servers up, put the Web browsers up, and we were in business."

Rothberg says the Internet made it possible to build a distribution system that otherwise would have been so expensive that his company would have had to seek venture capital money. Web technology freed his staff to concentrate on the development of genomics tools, a competitive arena where time to market is crucial.

Consequently, CuraGen's system evolved more quickly from a workflow system to what Leach calls a workflow discovery system.

"Imagine a very well-organized laboratory in which you are using Excel spreadsheets to track what is going on," says Leach. "That's how it got started. Then those Excel spreadsheets were automated and put into an Oracle database so that you could build them dynamically on the fly or bring them up and modify them. That's what evolved into tools for processing data. So with what we have now, you can take that data and ask questions, such as 'How many secreted proteins are different or similar between two samples?' or 'How many metabolic enzymes are involved in a particular degradations pathway?'"

When a company comes in with a new experiment, Leach says, all the data and queries must be formatted so that researchers on both ends of the Internet connection end up talking about the same things. CuraGen sends the client a set of bar codes and standard operating procedures for processing the tissue samples. The physical samples, such as

Pioneer Hi-Bred's black yeast RNA, are sent to CuraGen with bar codes. Working with the discovery scientists, the client fills in the data online, literally filling in blanks on CuraGen Web pages. Scientists at CuraGen and at the client company then work together online, adding notes and comments. CuraGen enters a study statement that explains the objectives of the experiment, and the work gets underway.

"The first step is usually to take a lump of meat—the tissue—and turn it into single cells," says Leach. "Then we take the single cells and isolate the genetic material inside. That genetic material gets processed in various ways to generate the data we need. Then we label it with fluorescent tags so that we can read a snapshot of what's inside the cells on a machine. We developed that architecture so that given a DNA or a protein sequence, it can put it all in the form that is needed and will have links to other relevant information."

The goal, says Leach, is often to identify disease genes, whose proteins can serve as drug targets. Those drug targets can be put into experiments that mimic the disease, and then the drug targets can be screened against large numbers of molecular compounds in the hope of revealing some beneficial interaction. Eventually, says Martin, those drugs that appear to interact with the disease can go to preclinical tests in animals.

The catch, says Leach, is that the final stages of that process are, at this point, largely theoretical. The proteins built from Pioneer Hi-Bred's promising genetic sequences, for example, have yet to prove that they can prevent fumonisin from growing in corn. Researchers at Pioneer Hi-Bred are now taking the next steps: turning those genes into proteins, mixing those proteins with the toxins and injecting the toxin in horses. If the horses remain healthy, Pioneer Hi-Bred will try to engineer the genes into a new fumonisin-resistant strain of corn. There is a certain degree of faith involved, but there is also a lot of promising science. Enough, at least, to persuade the big pharmas to bet hundreds of millions of dollars that bioinformatics is the cornerstone of 21st century medicine. **CIO**

Senior Editor Art Jahnke can be reached at ajahnke@cio.com.

BY DESIGN

Boston's Massport Site Keeps Things Moving

www.massport.com

AFTER

ORGANIZATION

The Massachusetts Port Authority (Massport), Boston

REASON FOR REDESIGN

The old site was static and hard to update.

DESIGNER

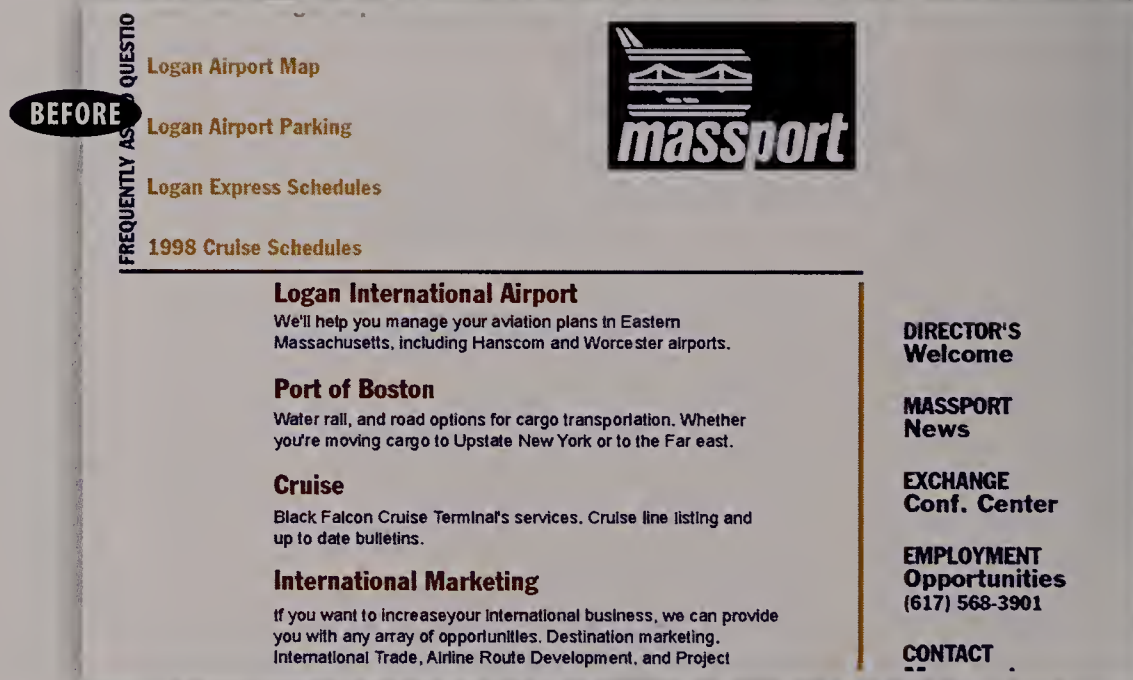
RainCastle Communications Inc., Newton, Mass., and NetNumina Solutions Inc., Charlestown, Mass.

WHAT'S NEW

The site offers up-to-date flight, parking, weather and traffic information; a more flexible information architecture makes it easy to add content.

THE MASSACHUSETTS PORT AUTHORITY—OR MASSPORT—oversees the bustling airport, seaport and bridges that bring millions of visitors and dollars into the Boston region every year. When Massport embarked upon a redesign of its Web site, it wanted to improve service to all of its customers, whether they be tourists flying out of Logan International Airport or contractors bidding on a remodeling job.

Massport turned to RainCastle Communications Inc. for the front end of the redesign and NetNumina Solutions Inc. for back-end integration. The site now offers real-time information on flight arrivals and departures; it also lets users keep tabs on flight status via e-mail or via an automatically updated browser window. Contractors can find out about proposed, advertised and awarded construction projects, information that the site draws from an existing database. Many of the content areas are still just HTML pages, but new authoring tools make it easy for Massport employees to update that content without coding HTML.



MASSPORT'S ORIGINAL WEB SITE had a weak brand identity and an inflexible information architecture.

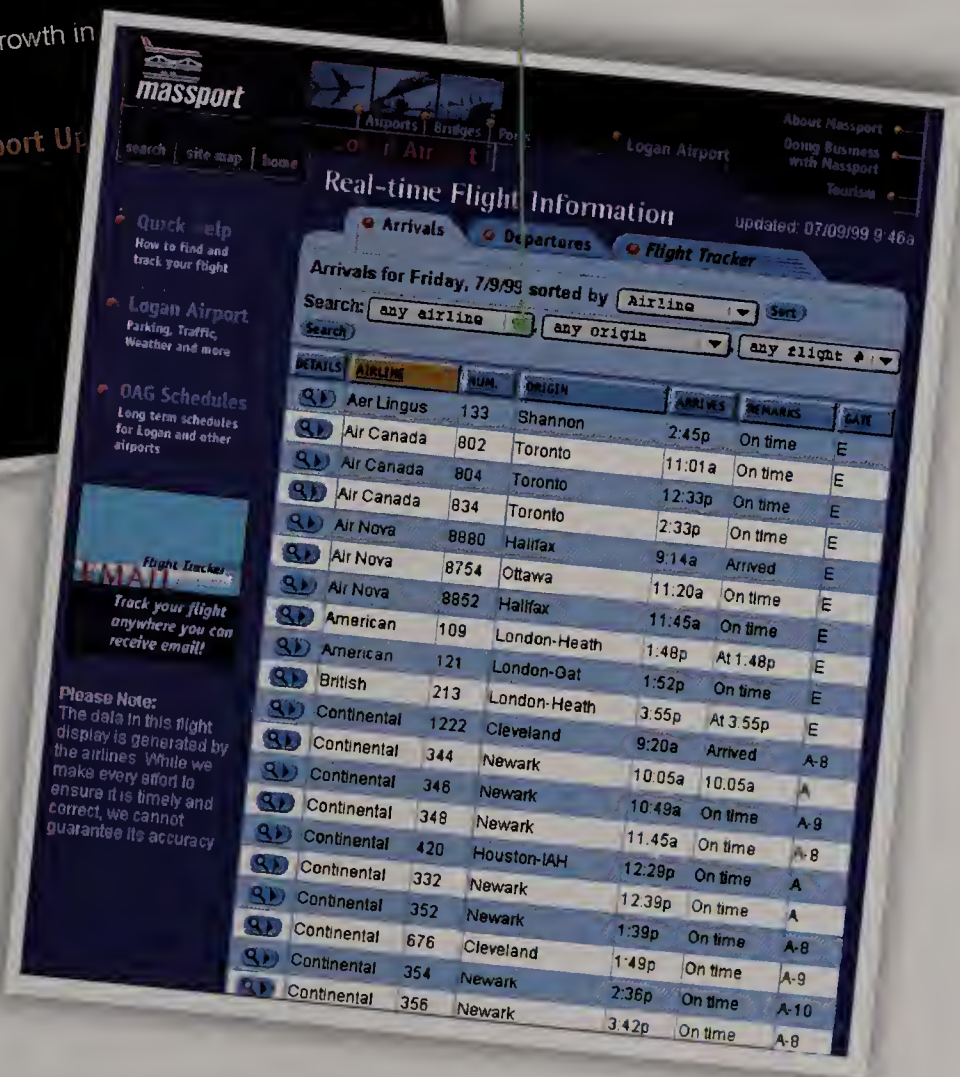
NAVIGATION BAR REPEATS on interior pages, enabling users to click from one major section to another without returning to the home page.



JAVASCRIPT ROLLOVERS change the color of each link and offer additional information.

FLIGHTS CAN BE searched and sorted by several criteria.

SMALL JAVA APPLET scrolls news headlines across home page.



Calling All Web Sites

What do you get when you cross your call center with your Web site? Happier customers.

BY DAN SWEENEY

T

HREE YEARS AGO, LUCASARTS ENTERTAINMENT Co. was on its way to becoming a victim of its own success. As a leading purveyor of high-level, multi-player computer games, the Lucasfilm Ltd. spinoff found itself constantly inundated with questions from gaming enthusiasts on the finer points of its various electronic entertainment.

In response, the company hired ever-greater numbers of technical support personnel in order to interact with its inquisitive customers one on one. "We didn't know any other way to respond to our customers' demands back then," admits Brian Carlson, knowledge base administrator for the San Rafael, Calif.-based company. "It may sound strange because we're a technology company, but we didn't even have a Web site then," he says.

Not that one hadn't been in the works. As a leader in the effort to create the company's Web site, Carlson saw an opportunity to solve the company's customer service dilemma. He had heard of software from a San Francisco company named Inference Corp. that enabled call centers to use their company Web sites to assume many of the routine responses handled by overworked call center agents. "Today," he reports, "we are able to answer 80 percent of our customers' questions at the Web site, although a caller can access the call center directly through

the Web site if there's still a problem. We have between 500 and 1,000 successful searches per day."

Mark Tonnesen, IT senior director of customer advocacy for Cisco Systems Inc., had a different problem a year ago when he also made the decision to integrate the company's Web site with a call center. Predictably, Cisco already had a highly elaborate, informative site, but Tonnesen questioned whether it was all the sales tool it could have been. "We didn't think it was answering customers' presales questions adequately. People couldn't decide what product to buy, and they often just gave up," he says.

Cisco found the answer in Burlington, Mass.-based WebLine Communications Corp.'s software solution suite, products that, while akin to the Inference software, emphasized facilitating communications across the Web site from the call center rather than enhancing inherent Web site functionality. Through WebLine solution software, customers can participate in chat or telephone exchanges with a



ILLUSTRATION BY CYNDY PATRICK

Say What
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Demand and Supply
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Tomorrow and Tomorrow
Page 64

Think Local
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-pluribus

e plu-ri-bus u|num [[Latin]]

unum

out of many, one.

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sales agent while online, and sales agents can use a supervised browsing function that enables them to push selective Web pages or even large files to the customer. The agent can also use collaborative "whiteboarding" sessions, where documents are shared and software is demonstrated for the customer while continuing to interact with customers.

Initially at Cisco, the software placed heavy demands on agents as they struggled to learn the necessary skills, but ultimately, Tonnesen says, the payoff justified the transitional discomfort. "It's too soon to quantify the results from the changes," he says, "but I have no doubt that customer satisfaction has increased."

All Together Now

LucasArts and Cisco are using a new kind of customer support software that promises to revolutionize electronic commerce. Known as Web site/call center integration, integrated contact center or teleweb software, this business tool aims to provide unified administration of all contact points while simultaneously and transparently routing callers to appropriate information resources. "Companies are finding that Web sites and call centers need to be integrated seamlessly," explains Geoffrey Bock, senior analyst with the Patricia Seybold Group in Boston. "We expect a lot of growth in that area."

Two key concepts figure into this new model for remote business transactions: endowing the Web site with the intelligence to serve the customer better—in essence, to support customer interactions with software agents; and providing for customer/sales-force interactions within the Web site as well as via a telephone connection.

One product differs considerably from another in its ability to profile the customer or process customer requests. It also differs in the scope of the interactions between customer and sales agent permitted at the Web site. Nevertheless, most of these packages address common concerns of the sales department; namely, how to use sales-force automation and human resources synergistically.

Web site/call center integration products are a subcategory of computer-telephone integration (CTI), but they differ radically from earlier approaches, which were really about automating the phone system or providing more narrowly defined software support to sales agents. In the past,

Say What?

Natural-language searches are better than Boolean, but not perfect

AS IF THE PURE VOLUME of information available on the Web wasn't enough of an obstacle to finding relevant information, consider how many people cruising the Web today are not wise to the ways of Boolean search queries. It's one thing to post relevant content on a Web site and quite another to enable visitors to find it quickly.

One way to reduce the random nature of Web searching is to employ technology that incorporates natural-language processing, which allows searching in plain English.

"Natural-language technology is able to understand in context what simple words mean," says Peter Tomassi, executive producer at Looksmart Ltd. (www.looksmart.com), a Web directory that supports natural-language searching. For example, a query such as "Who is John Denver?" in the Looksmart search engine will return links related to the late singer, not for someone named John who lives in Denver.

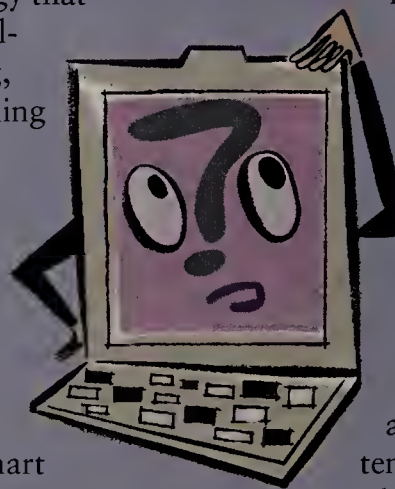
Of course as with any search tool, a natural-language query is only as comprehensive as the database it searches. In some situations, the end user has to work to find what they're looking for. One example is Richmond, Va.-based CSX Corp. On the company's search page, a query of "Who is the CEO?" returns a link to the company's board of directors, many of whom are CEOs at

other companies. If it's John W. Snow you're after, you'll have to read the list. Moreover, even a more targeted search, "Who is the CEO of CSX?" would still not yield the information you're after because the database identifies him as chairman. No matter how good the natural-language technology, you won't find information that's not in the data you're searching.

At Ask Jeeves Inc. (www.ask.com), the power of natural-language processing is coupled with a question-and-answer database specifically designed to field customer queries. Ask Jeeves, based in Berkeley, Calif., analyzes the content on a client's Web site "much in the

manner of playing Jeopardy," says Frank Vaculin, senior vice president and general manager. The idea is to use natural-language technology to engage customers in an active dialogue with a site until they find answers to their questions. Customers such as Dell Computer Corp. and Office Depot Inc. use Ask Jeeves' natural-language approach for tech support and sales.

Vendors are also marketing their products to the ever-expanding universe of corporate intranets. LexiQuest Inc. (www.lexiquest.com) develops software that simulates the conceptual relationships among words to get at what a user is really seeking. —Megan Santosus

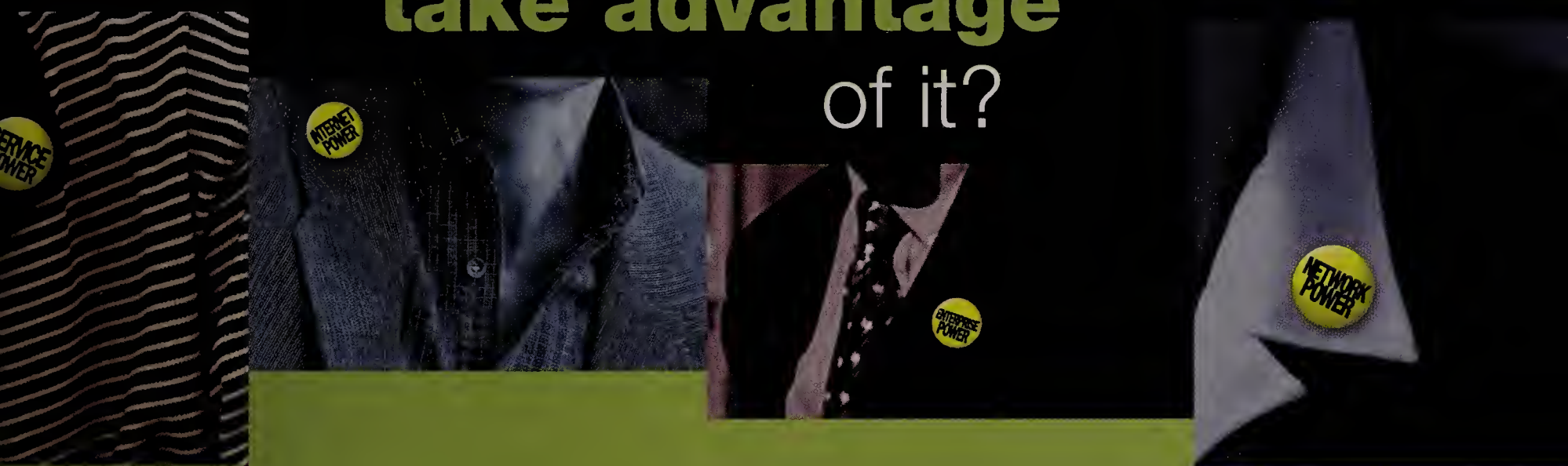


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CTI in the sales/support context was generally used to enhance the effectiveness of an existing operation—the call center—through such applications as predictive dialing (automated dialing from a list of preselected numbers), automatic call distribution (ACD) for assigning callers to agent queues and automatic “screen pops,” whereby customer information is displayed to the agent at the same time telephone contact is made.

A parallel but functionally distinct development was interactive voice response (IVR), where a program performs the function—often ineffectively—of a switchboard operator. Frequently, those same functions are incorporated into Web site/call center integration software, but the difference between the new products and the CTI solutions is that the Web site has now entered into the equation as a likely first point of customer contact. Thus the Web site has become an extension of the call center and vice versa. What is being created is a unified presence meant to change the nature of the online buying experience for the customer.

The simplest manifestation of the new phenomenon are the Call Me icons featured in nearly all of these software offerings. A click on this icon and the entry of a phone number immediately summons a sales agent. Many systems also feature a chat function where the customer can communicate

The Web site has become the call center and vice versa, changing the nature of the online buying experience for the customer.

with an agent via text in real-time as well as in e-mail. An emerging capability is IP voice, which is ultimately the goal, where conversation is seamlessly integrated with a multimedia presentation over visual Web content.

“Companies are scrambling to support all modes of communication,” notes Patrick Fetterman, senior product marketing manager for eGain Communications Corp. in New York City. “That’s led to a lot of partnering because few companies do everything well.”

Once agent contact is initiated from the Web site, the capabilities of the various systems tend to diverge. Most allow sales agents to employ supervise browsing, that is, to escort the customer to various areas of the Web site. Some products, such as those from WebLine, eGain in Sunnyvale, Calif., and ActiveTouch Inc., also in Sunnyvale, go even further. They permit the transmission of whole files and applications across the Web and, in some cases, the temporary configuration of the customer’s terminal as a thin client for conducting, say, a sales demonstration or a technical troubleshooting session. All three of these products enable PowerPoint demonstrations, complete with pointers.

While most contenders in this marketplace now support multiple means of communication, they were initially designed for a single channel. For instance, Kana Communications Inc. in Palo Alto, Calif., originally emphasized e-mail, while eShare Technologies Inc. in Commack, N.Y., and WebLine stressed chat and voice. “You get companies coming into this business

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from a number of different angles," observes Robert Weinberger, vice president of marketing for WebLine. "You've got the dot-com companies coming out of the Web and into the call center, and you've got companies with backgrounds in telemarketing going in the opposite direction."

Some products place equal emphasis on customer relationship management (CRM) functionality, especially those from Clarify Inc. in San Jose, and The Vantive Corp. in Santa Clara, Calif.—established companies that initially marketed products for call centers only. In these products, customer profiles are established by the software based on current and past transactions and interactions, and the customer is then directed to an agent with the appropriate skills

Primus and its main competitor, Inference, attempt to do just that by using knowledge-base software, actually a species of search engine for individual Web sites that answer customer queries based on key words and analysis of patterns of paths taken by the customer through the Web site. Primus uses case-based reasoning, which is known for its high accuracy in answering customer queries posed in natural language (see "Say What," Page 62).

Not There Yet

Despite the apparent potential for teleweb products, most companies in the industry admit that developing effective products is a challenge. "You're trying to integrate telephone systems, which traditionally use closed architectures and

Most companies are trying to speed sales reps into the online sales process on the theory that human presence can dramatically increase the closing rate.

and knowledge. In some systems, the customer's needs and status may be prioritized according to the urgency of the problem, the size of the order or the customer's past history with the company.

The majority of the companies playing in this new space of Web site/call center integration are trying to speed sales reps into the online sales process on the theory that a human presence can dramatically increase the closing rate. "There's still such a thing as selling," observes Chris Martins, a senior analyst with Aberdeen Group Inc. in Boston.

But other developers see a fundamentally different objective for integration software: the reduction of sales agent intervention. "The dollar savings are simply staggering," claims Skip Walter, vice president of product development and technology for Primus Knowledge Solutions Inc. in Seattle. "Every customer contact with a sales agent will cost a company an average of \$20," he says. "A Web site hit runs about a nickel. You shouldn't try to eliminate the sales force entirely, but you should try to handle as much of the customer's needs as possible at the Web site."

proprietary protocols, with the Web, which is open," explains Bock of the Patricia Seybold Group. "That's difficult."

Adds eGain's Fetterman, "You have to somehow try to make every application work over the Web with every browser. Exclude a browser and you exclude a potential customer. But how do you maintain full functionality with all browsers?"

Because of such challenges, most software companies admit their products are works in progress, but all are confident that they're poised to play a pivotal role in e-commerce. "Companies doing business on the Web have to start offering more in the way of service," insists Steven Gal, vice president of marketing for Inference. "Right now a lot of companies are still trying to compete on the basis of price, but price itself is becoming a commodity. You have to do more," he says, "because you're competition is only a click away." **CIO**

Dan Sweeney is a freelance writer in Burbank, Calif. He can be reached at dswee34359@aol.com.

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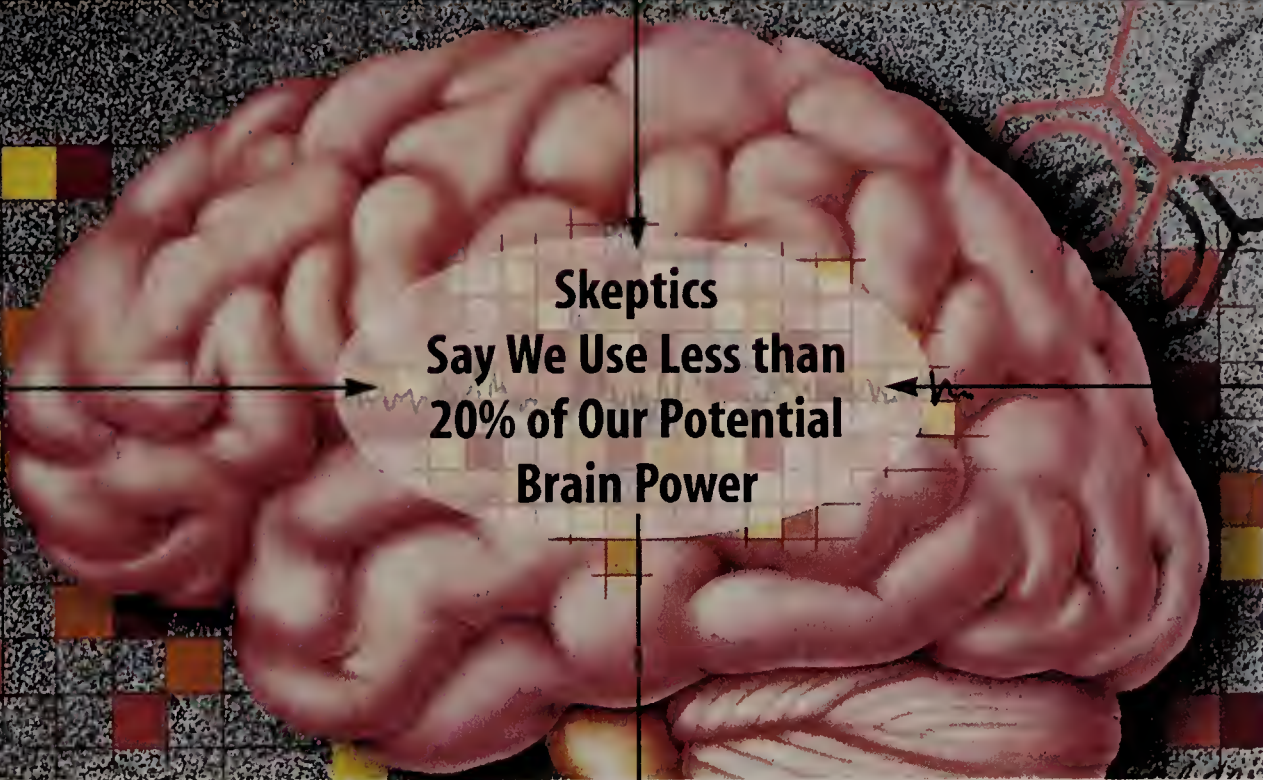
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BACK TALK

THINKING AGAINST THE GRAIN

Ann Delligatta on Platform Building

Executive Vice President and COO Ann Delligatta joined Irvine, Calif.-based Autobyte.com Inc. in 1997 as CTO, overseeing development of the company's Web site. J.D. Power and Associates named Autobyte.com tops in dealer satisfaction with online buying services for the second year in a row.

CIO Web Business: In 1994 and 1995, when people talked about disintermediation, the examples they always used were car dealers, realtors and travel agents. How did you overcome dealer skepticism?

I think at least a third of our dealer base came on board because they were afraid not to. We show them how much it costs to sell 100 cars traditionally—with their traditional salaries and traditional marketing costs. With the Autobyte.com model, it's \$100,000 savings for the dealer. The middleman—Autobyte.com—is a positive thing rather than a negative. And it increases volume.

Is it a constant process of adding dealers and booting others?

Culling definitely goes on. Every consumer who goes through the system gets a quality assurance survey. We get back between 8 percent and 12 percent. That allows us to give the dealers

report cards. We let them know what consumers are saying about them, but it also gives us important information. We'll put a dealer on watch if a consumer has complained about the pricing. Because every once in a while a dealer will think, "Well maybe I can get away with inching up the price." When dealers' scores fall, we proactively call 30 days' worth of consumers and ask what their experience was. We'll determine what training is required and send someone to talk to the dealership.

Autobyte.com was the first Internet company

to do a Super Bowl ad. How do you approach offline marketing?

A lot of our marketing has been about being the first to a specific marketing approach. I don't know when we'll run out of firsts, but that's our thought process. Traditional advertising, particularly TV, has performed very well for us.

How do the development teams work here?

A year ago we found that there was so much maintenance and fine-tuning going on, it was difficult for us to stay ahead of the technology game. So we now have a team of folks who play and experiment—a for-

ward-looking development group—in addition to the maintenance group.

What does your dealer advisory board do?

It started out with us telling them, "This is the plan." The dealers that get it want us to take it to the next level. At the last meeting in October, they were throwing out ideas. They asked us to offer different languages on the site: a real dealer push. We also got some push-back on our contracts: Because they have made Autobyte.com so much of their business, they want to make sure they don't get into a situation where we can terminate them unless it's for cause. So we tightened up the contracts.

Where do you see Autobyte.com going?

We have a wonderful platform to build upon, and I think the pressure will be on us to continue to build upon it but faster. Anyone here who thought we'd get to the IPO and relax was dead wrong. Our report card is on the Internet every afternoon. You look at where you close. But it's fun. I've never had so much fun before. —Scott Kirsner

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